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Electrical World

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State Regulation Has Proved Itself

POLITICIANS are trying to play football with state regulatory commissions. This is evidenced by bills presented in many state legislatures and by outpourings in the halls of Congress. These rumblings are not serious, but they show a lack of knowledge of what state regulation has accomplished and of how effectively it operates to safeguard the interest of the public.

People forget the conditions that arose prior to the period when regulation was started. They forget the battles for short-time franchises, the high rates for financing, the high rates for service and the abuses that had grown up in many instances. State regulation brought order out of chaos and made possible healthy utility growth whereby service was improved and expanded rates reduced. Reductions aggregating millions of dollars have been made year after year, and there is little doubt that other reductions will follow as the industry grows. Nearly all commissions have calmly and carefully built up the confidence of the public and of the utilities in their integrity and have handled a difficult task well.

The claims of excess profits, lack of control, delay through court action, excess capitalization and others of like kind are mere balderdash. The commissions have on record the money spent by the utilities; they control utility financing in a large number of states, and in all states, to the extent of their jurisdiction, they make the rates on the basis of a reasonable return on the property actually used in producing the service. Shallow politicians and agitators should go to the state commission headquarters in their respective states and find out by personal inspection how the commissions operate and how well armed they are with facts and figures. If they did this, they would not try to prevent the commissions from going on with work that is making electric service cheaper and better as the years go by.

* * * *

Aiding Community Growth

UTILITY companies that advocate and actively promote industrial development in the communities they serve are doing something that should be a benefit to themselves as well as to the other members of the community. None the less, this very recent trend in the commercial policy of utilities must be watched carefully and guided skillfully lest it do more harm than good. When ill-advised promotional efforts are followed by the failure of an industry the unfavorable effect upon the utility and the community is serious.

It is good policy to take the advice and hire the services of specialists in industrial development. It is good policy to start with industries already established before undertaking the promotion of new industries. In many localities there are industries that need only capital and business advice to become prosperous, and ways should be found to give these aids. In Dallas and Tulsa farsighted civic leaders have incorporated as a group to render these services to local industries, and the utility executives co-operate in their plans for civic development. No satisfactory plan for community development can be carried out except with the co-operation and sympathy of all elements of the community, and a great amount of educational effort and investigative work is required to get a full understanding of all elements of a specific industry promotional scheme.

Utilities can well survey their territorial assets in labor, industries and raw materials, and they can well afford to retain industrial specialists to help the communities reach their full industrial possibilities. Astonishing results have been had in some localities as a result of promotional work by light and power companies, and there is little doubt that great direct and indirect benefit will accrue to any utility that takes leadership in community development. It is good business and it is good public relations.

* * * *

Finis, Worcester Versus the Massachusetts Commission

WITH the acquisition last week of the Worcester Electric Light Company by the New England Power Association came also the end of the court proceedings by the company against the Massachusetts Department of Public Utilities. President Comerford of the association announced the intention to withdraw the case from the federal court as soon as the approval of the Worcester directors was voted; that approval was granted at once, and victory rested upon the commission's efforts. The history of this celebrated case need not be recounted here except to point out that it has been costly from every viewpoint. The low maximum rate of five cents ordered by the commission is a handicap to promotional rate design, and the contest has made a great deal of trouble for the industry notwithstanding the company's right to appeal to the courts when it felt itself aggrieved.

The company might have won its reproduction-cost rate base had the proceedings finally wound up in Washington, but even if it had, the value of its victory in relation to future rate developments would probably have been none too certain. It is easier to look backward than forward, and had the value of inducement rates been as clear in Massachusetts three years ago as it is today, the battle would probably never have taken place. Fortunately, the rate problem in this particular company is reasonably sure to be resolved in due course along promotional lines even in the face of the present five-cent maximum, and there is no little significance in the atti-

tude of the management of the New England Power Association in accepting the regulative findings of the commissions throughout the entire territory and in whatever state the organization's subsidiaries operate. It should not be forgotten that with the passage of time the difference between the reproduction-cost rate base and the so-called investment base is constantly decreasing, and that the whole issue is almost certain to become of merely academic interest in the not distant future if prices maintain their present approximate level.

* * * *

Interconnection Relieves Acute Northwest Water Situation

LACK of precipitation coupled with unusually cold weather which prevented melting of snow and ice so restricted stream flow and hydro-plant output of Pacific Northwest utilities that a critical situation was faced during the latter part of last year and the early part of this year. Several hydro-electric plants were virtually shut down from lack of water, and those companies that had steam reserve taxed it to the limit.

So critical was the situation in western Washington that service to some large customers with provisional contracts had to be curtailed. Had not interconnection come to the rescue the situation would have been much worse. The Washington Water Power Company was more favorably situated than companies either to the east or west and was able not only to carry its own load, but to supply large blocks of power through interconnections to the Montana Power Company to the east and to the Puget Sound Power & Light Company to the west.

No better evidence of the value and economy of interconnection could be found than this. It enabled three large systems to take full advantage of every available bit of power no matter where produced or when available. It permitted taking advantage of such diversities of stream flow as existed and of utilizing steam generation to the best advantage. Fortunately, the Northwest began a program of interconnection some years ago, and as systems grow in that territory and power markets develop, interconnection will proceed apace and make possible the most economical utilization of the water powers of the territory as a whole.

* * * *

Duplexing Fuels to Cut Costs

SHIFTING prices of coal and fuel oil emphasize in some localities the economic possibilities of designing boiler plants and fuel systems to take advantage of favorable spreads between the two. While such a problem has many aspects, the question at bottom is reducible to a series of cost comparisons in which one fuel is played against another throughout a considerable price range. Due weight is of course given to the contrasting equipment investment requirements and consequent overheads and operating outlays to handle the assumed loads.

The advantages of being able to burn either type of fuel are illustrated in an Eastern tidewater station of about 65,000-kilowatt rating, which began service about four years ago with fuel oil costing about $1.75 per barrel. The initial installation was 30,000 kilowatts, and the load grew rapidly during the period. Two new boilers were added to an original three in 1927, as well as a second turbo-generator. Pulverized coal was burned under the new boilers in 1928 at an average cost of about $4.12 per short ton. Both types of fuels were burned last year, and the price of oil fell to an average of $1.38 per barrel. Plans are afoot to return to oil on the basis of not far from $1 per barrel, and the latest contract is expected to work out so favorably that the fixed charges on the coal-handling plant at this station will be far more than covered in two years. Since the total fuel bills of this station have lately exceeded half a million dollars a year, the ability conveniently to adapt station operations to the most advantageous fuel from the economic standpoint is greatly appreciated.

From a single case like this it would, of course, be unwarranted to draw sweeping conclusions pointing to the wisdom of duplexing the fuel supply to the boiler furnaces in general practice; but it is certainly a matter that should receive engineering consideration in localities where changing spreads between fuels may make such flexibility in design justifiable. The subject of equipping furnaces for the convenient use of more than one fuel type is a large one. The possibilities of getting the most out of the duplex scheme appear brightest in the areas of the country where fuels are more competitive. In the case in point it is estimated that the excess investment to enable both types of fuel to be utilized without serious difficulty was not more than 12 to 15 per cent of the cost of an equivalent one-fuel plant. There are a good many fine points to be considered in such comparisons of design, but of such are the fascinations of power-plant engineering.

* * * *

The Electrical Industry in the Chain-Store Situation

LAST week in Washington a half day was set apart in the program of the annual meeting of the Chamber of Commerce of the United States for the discussion of the present conflict between the chain store and the independent merchant. At first flash it would seem that the issue is of no immediate concern to the electrical industry. But throughout America 3,375,000 retail stores are purchasing electricity from the power companies for various uses. They are spending on the average $150 a year for electric service, as near as can be estimated from the somewhat indefinite records of the industry. What they spend for electrical equipment and materials cannot be even estimated for lack of mass statistics. But it is in the aggregate a large sum. The retail merchant is an important customer, therefore, and his prosperity means much to the electrical business.

There are in all about 1,200,000 independent merchants and 100,000 chain stores. That many independents are worried over this new type of highly organized competition, spreading over the entire land, was obvious to any observer at this conference on "mass merchandising." Some are forming defensive alliances for group purchasing. Some say: "There ought to be a law." Some are confident that independent responsibility and initiative are stronger than size and system. But, all in all, the average merchant is anxious and looking for a way out.

As a matter of fact, this is just one more skirmish in the age-old contest between the forces of tradition and the forces of progress. The world changes, but the merchant, like every other man, desires to be left alone,

to keep his store as he has always kept it. He is alarmed that his store is refusing to keep him in the old way. Yet the whole world recognizes that present costs of distribution are too high and that something must be done about it. The chain store—right or wrong—is at least the only large-scale contribution of original thought that has been offered for the solution of this complex economic problem. Whether the chain idea is all right or half right or will be swept away within ten years, today it is certainly arousing the retailer to action. It is forcing a close scrutiny of old methods and an analysis of principles such as have not been had before.

The advice given to the independent merchant in the meeting was this: Watch the chain stores. Appropriate their good ideas. Avoid their mistakes and weaknesses. Capitalize every advantage of independence. Improve the efficiencies of merchandising. And this is sound advice. It points an opportunity to the electrical industry that should be eagerly developed.

Here are many more than a million customers with a problem on their hands. How can electricity serve them in ways that will save manual labor, or facilitate operation and management, or stimulate sales? The average store is not perfectly lighted. It is not utilizing all possible equipment in the stockroom, in the office and at the counter. Yet through just such improved precision and economy will the cost of retail distribution in America eventually be reduced. And in the process the electrical industry will sell an enormous volume of goods and pile up a vast additional annual energy consumption.

The present trade warfare between the chain store and the independent is a purely economic conflict. The electrical man is on neither side. But the situation is a challenge to him nevertheless. He should help toward a sound and a speedy solution.

* * * *

Honoring an Industrial Hero

FEW men have during their lifetime received so large a measure of honor as will be showered on Thomas Alva Edison during "Light's Golden Jubilee"—the fiftieth anniversary of the incandescent lamp—by his own country and many foreign nations as well. Yet who is more deserving of this homage? Symbolizing inspiration, research, versatility, practicality, perseverance, hard work and public service, Mr. Edison has the right to be held up as an inspiration to youth and as the industrial hero of America. Although the electrical industry cannot claim Edison entirely as its own because of his contribution to many other fields, he is peculiarly identified with light and power. The coming jubilee affords the opportunity to demonstrate civilization's gratitude to him. Very appropriately golden light has been selected as the symbol of this gratitude.

It is to the credit of the electrical industry that in making its plans it has definitely gone on record to avoid any activities which would commercialize this celebration. Commercial profit will, of course, come from it, but hardly a plan has been discussed without insistence being placed on honoring the man, his character, achievements and benefactions above all and minimizing everything which could possibly be construed as conceived in the interest of personal gain. Instead of the lamp companies featuring the sale of special "golden-glow" lamps, as they might do, they are suggesting how inexpensive dips and color caps can be used to obtain the desired light. Moreover, the utilities have recognized that they must bear the largest share of the cost of local celebrations, although merchants will have the opportunity to participate. More than this, the national plans make light only the outward symbol of this celebration and lay equal if not more stress on other things, such as speeches, historic displays and motion pictures with human interest, that will characterize the man and the significance of his achievements.

Since the Chief Executive of the nation has accepted the honorary chairmanship of the sponsoring committee as the means of paying a personal tribute to the genius of a great national benefactor, every local organization which participates will surely perpetuate the high ideal inspiring the celebration by making the purpose, rather than the means, stand out. If the electrical industry can bring to public consciousness that the celebration connotes something more than kilowatt-hours and lamps—can make the people realize the value in usefulness, comfort and convenience of Edison's services to the home and factory—then "Light's Golden Jubilee" will be abundantly worth while.

* * * *

New Styles in Power Stations

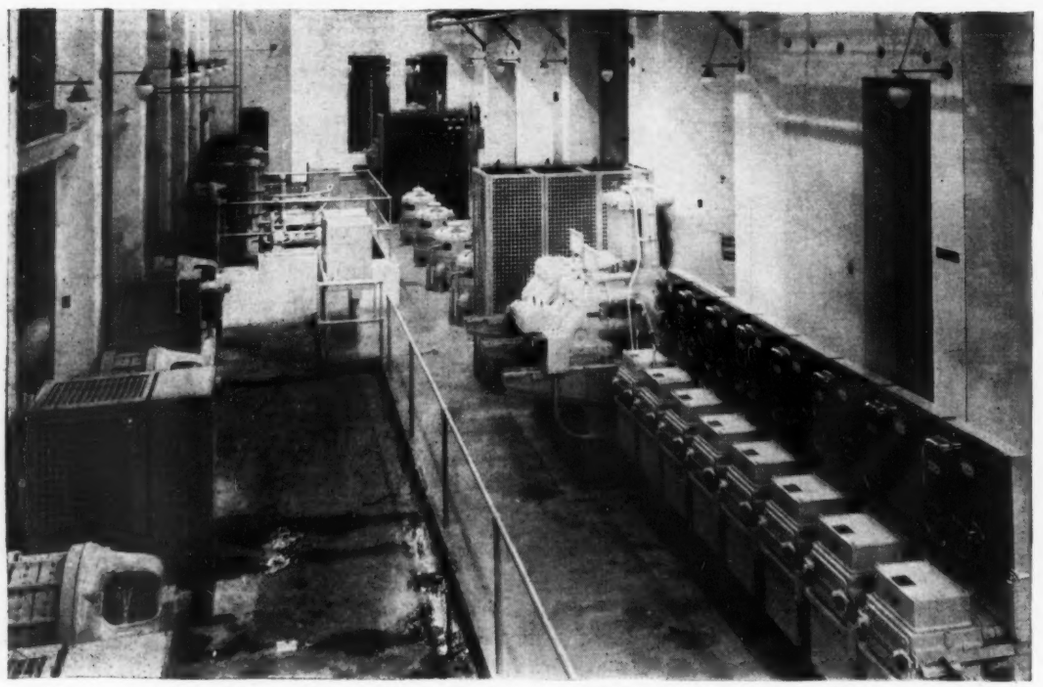
IT WOULD, perhaps, be premature to view the new Deepwater power station as a milestone marking progress down a single-track road of evolution for virtually all generating-station design, but this unusual plant does indeed presage others of similar characteristics where load and industry conditions warrant. Deepwater, a description of which appears in this issue of the ELECTRICAL WORLD, is jointly owned by two electric utility systems, is designed for 1,200 pounds steam pressure, will supply both steam and electric service to a nearby industrial plant, and may be expanded according to load growth without impairing the possibilities of segregating the divisions of the structure according to company ownership or use. The opportunity to evaluate, under closely comparable conditions, the relative merits of bin and unit systems of pulverized-fuel firing, since the two portions of the station used for utility-distributed energy are otherwise identical, has been fully utilized, and operating data of value to combustion engineers should result.

There is a real opportunity, where industrial and power plant conditions are favorable, to sell full utility service to industrial concerns requiring large quantities of steam and electrical energy, and utility men may well contemplate the field with interest. At Deepwater the industrial customer will purchase primary steam, adjusted for plant requirements and auxiliaries, and receive, without further charges, the process steam produced by the exhaust from the turbine allocated for its use and all the electrical energy developed by the passage of the high-pressure steam through it. Arrangements will be made for excess or reduced steam or energy requirements. This plan would not be suitable under all conditions for other classes of consumers, but undeniably there can be little quarrel with the eminently sound idea that a power station serving a large or varied type of load can generate steam more economically than can a user with less favorable operating conditions.

Specialists are not intrinsically more capable, efficient or infallible than laymen, but the probabilities are strongly in favor of passing duties on to those most familiar with certain tasks in the reasonable expectation that they will be well done. Supplying steam service may ere long be as definite a utility function as supplying electricity.

A Modern Pumping Station for Waukegan

Control of each filter bed is secured by individual bench-boards with push-button operation of wash water pumps



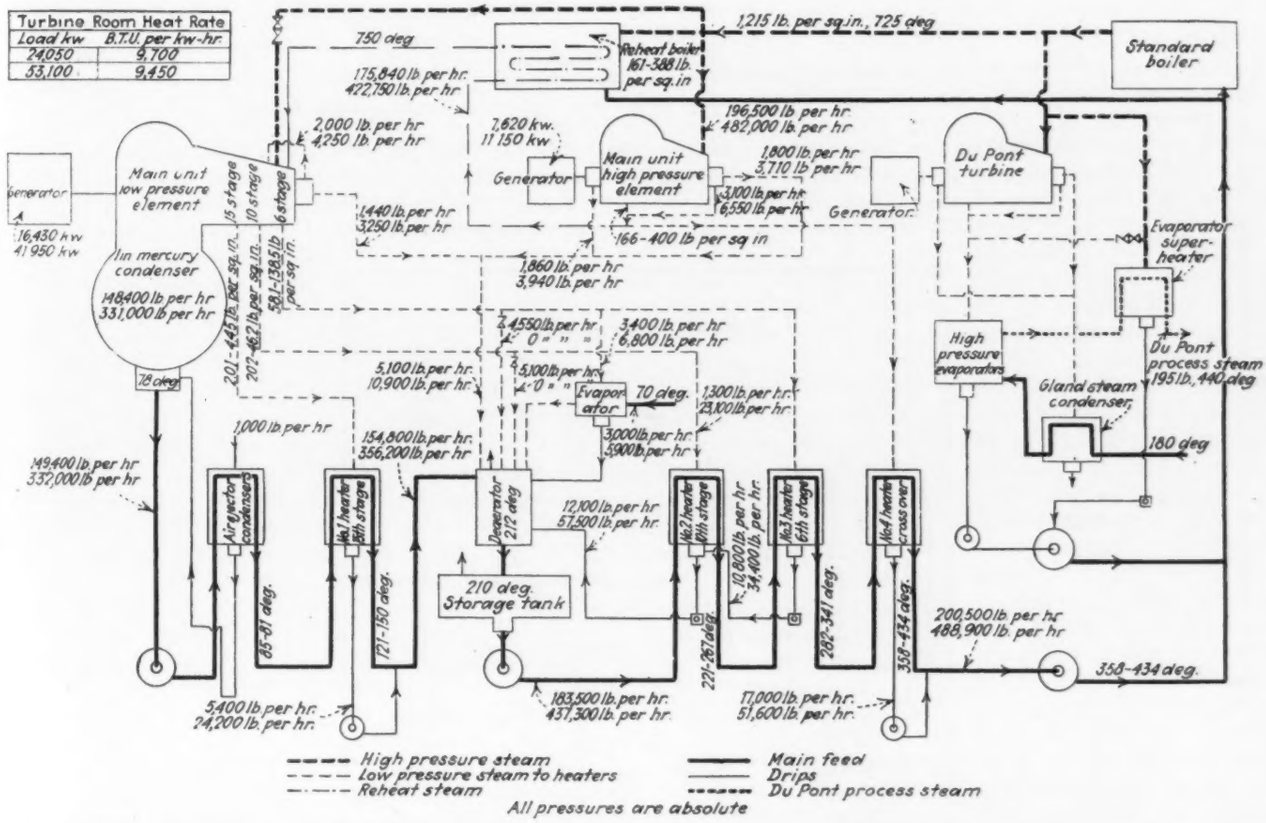
THE new water supply station of the city of Waukegan, Ill., is a fine example of electrification as applied to this class of service. The station is served by two 12,000-volt lines from the system of the Public Service Company of Northern Illinois and is a duplex installation. Reyrolle armored bus and switch gear has been used throughout. The main pump floor contains four vertical low-head raw water and four horizontal high-head clear water pumps.

Deepwater—
A Double-Purpose Station

1,200-lb. steam pressure selected for jointly owned station of the American Gas & Electric and the United Gas Improvement companies. Electric and steam service supplied to industrial plant

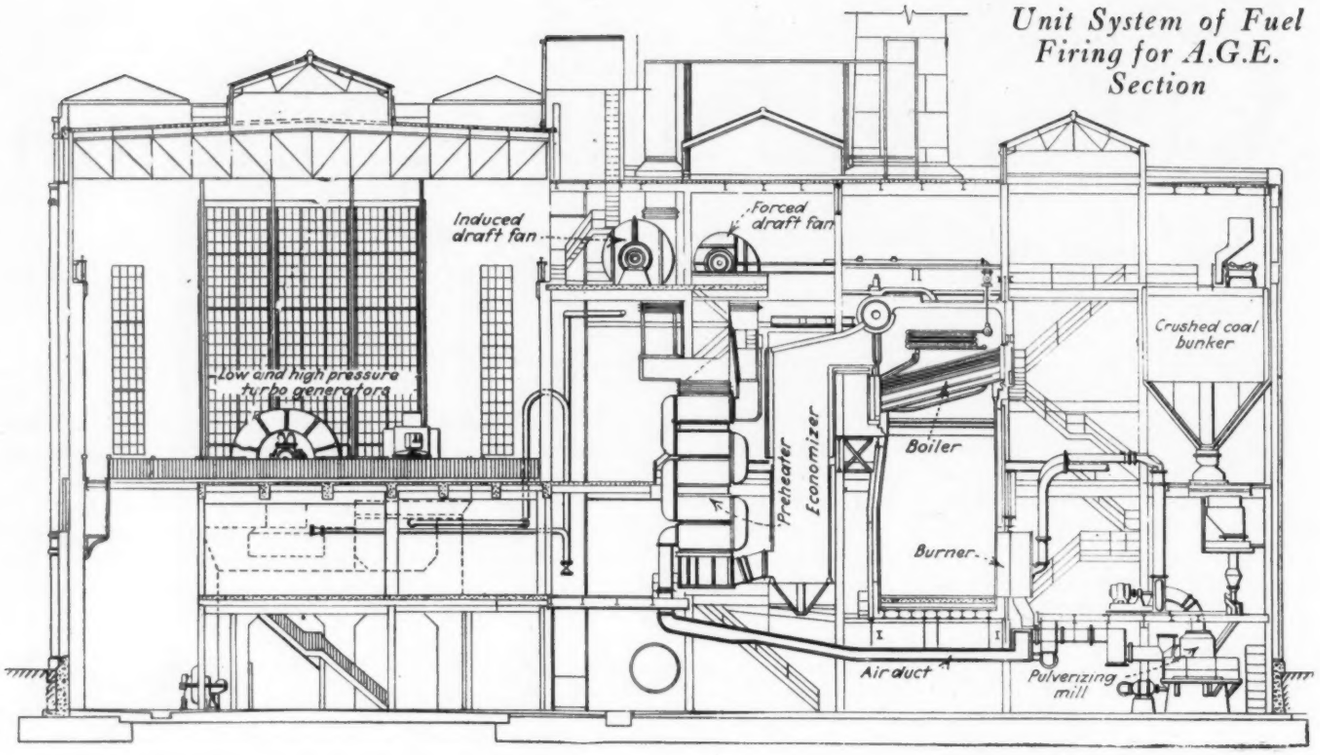
"IT IS no longer reasonable to pass up the opportunity to supply both electric and steam service to manufacturers who must have process steam when it is economically possible to take care of their full energy requirements," said B. F. Wood of Stevens & Wood, Incorporated, New York City, in discussing the new Deepwater station which this organization designed and is constructing for the American Gas & Electric and the United Gas Improvement companies. "It is to the advantage of both the utilities and the industrial plants to concentrate the generating work where possible. Deepwater will supply the transmission system of the American Gas & Electric Company, the Wilmington, Del., system and interconnections of the United Gas Improvement Company and the adjoining plant of E. I. du Pont de Nemours & Company, Inc., approximately 1,500 ft. distant.

"Notable among the features of Deepwater station are the use of 1,200-lb. steam pressure for generating purposes, the joint ownership of the station, which, incidentally has been planned with the general idea of possible financial, physical and contractual segregation of sections according to ownership, and the arrangements for supplying service to the Du Pont industrial plant. This is not the first plant to be jointly owned. The Windsor station, near Wheeling, W. Va., is the property of the Ohio Power Company, a subsidiary of the American Gas & Electric Company, and the West Penn Power Company. The Scranton Electric Company, another American Gas & Electric Company subsidiary, joined the Pennsylvania Power & Light Company in building the Stanton station on the Susquehanna River. The experience with both of these earlier plants demonstrated it to be practicable and highly economical for a dually


Turbine Room Heat Rate
Load kw | B.T.U. per kw-hr.
24,050 | 9,700
53,100 | 9,450
1,215 lb. per sq.in., 725 deg
750 deg
Reheat boiler 161-388 lb. per sq.in
Standard boiler
175,840 lb per hr. 422,750 lb. per hr.
196,500 lb per hr. 482,000 lb. per hr.
2,000 lb. per hr. 4,250 lb. per hr.
7,620 kw. 11,150 kw
Main unit high pressure element
Du Pont turbine
1,800 lb. per hr. 3,710 lb. per hr.
3,100 lb. per hr. 6,550 lb. per hr.
Generator
Main unit low pressure element
Generator
16,430 kw 41,950 kw
1,440 lb. per hr. 3,250 lb. per hr.
166-400 lb per sq in
Evaporator superheater
1in mercury condenser
148,400 lb per hr 331,000 lb per hr
1,860 lb. per hr. 3,940 lb. per hr.
4,550 lb. per hr. 0 " "
3,400 lb. per hr. 6,800 lb. per hr.
High pressure evaporators
Du Pont process steam 195 lb., 440 deg
5,100 lb. per hr. 10,900 lb. per hr.
5,100 lb. per hr. 0 " "
Evaporator 70 deg.
1,300 lb. per hr. 23,100 lb. per hr.
Gland steam condenser
180 deg
1,000 lb. per hr.
154,800 lb. per hr. 356,200 lb. per hr.
3,000 lb. per hr. 4,900 lb. per hr.
149,400 lb. per hr 332,000 lb per hr
Air ejector condensers
No.1 heater 5th stage
Deaerator 2½ deg
12,100 lb. per hr. 57,500 lb. per hr.
No.2 heater 4th stage
No.3 heater 6th stage
No.4 heater cross over
10,800 lb. per hr. 34,400 lb. per hr.
210 deg. Storage tank
85-81 deg.
121-150 deg.
221-267 deg.
202-341 deg.
358-434 deg.
200,500 lb per hr. 488,900 lb. per hr.
358-434 deg.
5,400 lb. per hr. 24,200 lb. per hr.
183,500 lb. per hr. 437,300 lb. per hr.
17,000 lb. per hr. 51,600 lb. per hr.
High pressure steam
Low pressure steam to heaters
Reheat steam
Main feed
Drips
Du Pont process steam
All pressures are absolute

Reheat Temperature of 725 Deg. Offers Control Element in 1,200-Lb. Two-Purpose Operation

Figures at various points on diagram refer to factors corresponding to turbine loads of 24,050 and 53,100 kw.



Unit System of Fuel Firing for A.G.E. Section

owned station to operate for the joint account of two owners. Careful studies made indicated that in the case of the Deepwater plant high-pressure steam could be sold with advantage to the near-by industrial plants.

"While the adoption of 1,200 lb. as a working pressure was influenced by the large amount of process steam required by the industrial concern, Stevens & Wood's analyses indicate the net over-all results as distinctly favoring 1,200 lb. as compared with lower pressure. The estimates indicate that the total cost will exceed that for a comparable 400-lb. pressure station by less than $5 per kilowatt installed. This additional cost is more than compensated for by the increased economy and is fully justified by the trend in progressive economical design. While the station is not yet in operation and the operating results are but estimates, the data available for both Boston and Milwaukee, the studies made in connection with the Holland station* and the conservatively evaluated manufacturers' guarantees leave no room for doubt as to the wisdom of selecting the high pressure. We do, however, wish to point out definitely that conclusions regarding Deepwater should not be interpreted to mean that 1,200 lb. is more economical than 400 lb. for universal application. The most economical pressure depends upon local conditions, particularly the price and quality of coal, load factors and other phases of highly complicated station design. Special studies should be made for each local condition."

The Deepwater station is located on the east bank of the Delaware River about 4 miles south of Penns Grove, N. J., and will supply the Atlantic City Electric Company, a subsidiary of the American Gas & Electric Company; the Delaware Power & Light Company and the Philadelphia Electric Company, subsidiaries of the United Gas Improvement Company, in addition to the Du Pont plant. The Delaware River Manufacturing Company is the organization undertaking the management, operation and maintenance of the station in the common interest of the owning companies. While planned for an ultimate capacity of 400,000 kw., the initial installation involves but three turbine units, one 53,000

*"1,200-lb. Steam for Holland," ELECTRICAL WORLD, March 2, 1929, page 429.

Intercompany Relationships at Deepwater

Owning companies each have half of capital stock of operating company.

Agreement for management, operation and maintenance as well as existence of operating company may be dissolved upon two years' notice by either owner.

Co-operation with company load dispatchers shall follow intent of written agreement regarding capacity use.

Operating company may not sell to others without joint agreement of owners.

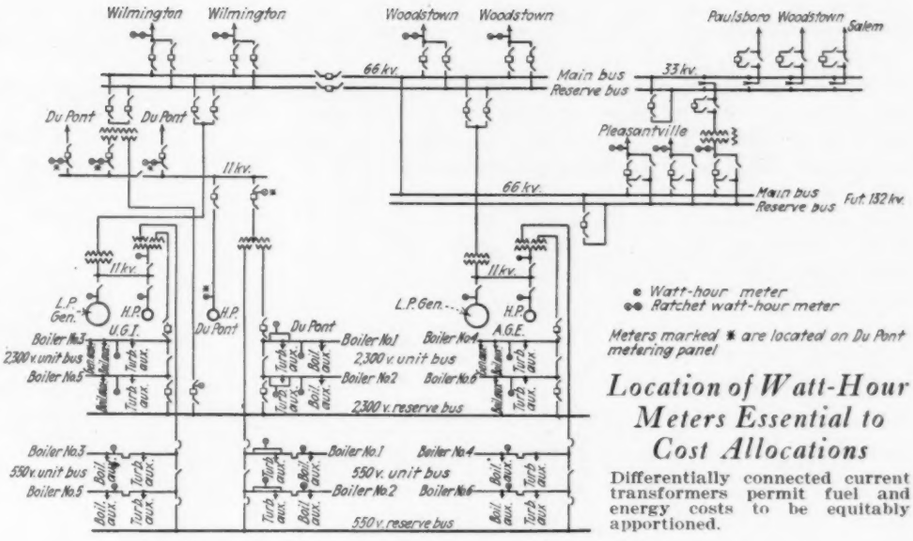
Monthly settlements with operating company for energy delivered.

Disputes to be settled by two arbitrators appointed by owning companies. Arbitrators select a third.

Industrial plant purchases service through billing of steam generation costs, proportional fixed and operating charges, etc., adjusted for equity. It receives all electrical energy generated by turbine provided for its use the exhaust steam of which provides process steam through evaporators. Thus basis of service charge is primary steam use (adjusted) and not electrical or process steam supply.

Industrial plant may withdraw from agreement upon specified conditions at termination of present contract.

kw. for the American Gas & Electric Company, another 53,000 kw. for the United Gas Improvement Company and a 12,500 kw. for supplying Du Pont requirements. The turbo-generators are all designed for 1,200 lb. steam at the throttle with 725-50 deg. total temperature. The two 53,000-kw. units are cross-compound machines consisting of an 11,000-kw. high-pressure and a 42,000-kw. low-pressure turbine. The Holland station of W. S. Barstow & Company, described in ELECTRICAL WORLD recently, contains a similar unit. The 12,500-kw. turbine supplying Du Pont requirements is identical in design with the 11,000-kw. high-pressure turbine and can be incorporated in a cross-compound unit should future developments in energy disposal lead to the desirability of so doing.



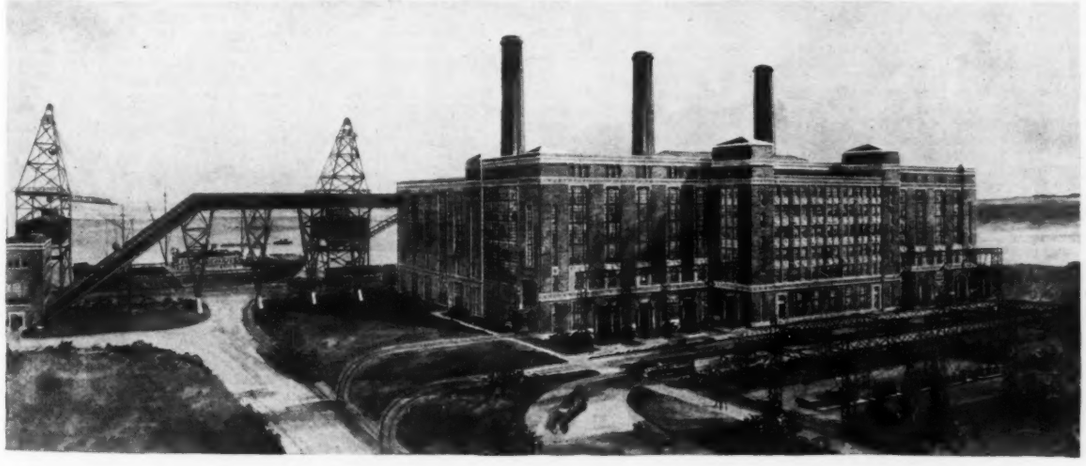
Location of Watt-Hour Meters Essential to Cost Allocations

Differentially connected current transformers permit fuel and energy costs to be equitably apportioned.

The steam from the high-pressure turbine passes to the reheat boiler and then to the low-pressure turbine, as indicated in the heat-balance diagram. The exhaust from the Du Pont unit, 530,000 lb. of steam per hour at full load, passes to evaporators which will deliver 400,000 lb. of vapor per hour at 180 lb. pressure. This steam is then superheated to 440 deg. total temperature by live steam superheaters taking steam at 1,200 lb. In cases of emergency the 53,000-kw. units can be run without the high-pressure turbine being in operation through a reducing orifice and throttle valve built in the low-pressure machine. The low-pressure turbine is bled at the sixth, tenth and fifteenth stages. The extracted steam is bled into closed vertical heaters. There is also a cross-over heater which uses steam from the high-pressure turbine exhaust, as may be seen in one of the accompanying illustrations.

"In order to prevent recirculation of the hot discharge from the condensers," said Mr. Wood, "tidal changes in river flow have been put to work. This is done by having the discharge water release through individual lines to a discharge channel open at both ends, and as the tide changes the end through which the hot water flows back to the river is alternated. The intakes are located 18 ft. below mean low water and independent lines are used to serve the condenser pumps on each main unit. Full load must be maintained during the summer months when low water occurs at the interconnected Conowingo hydro station of the Philadelphia Electric Company, and for this reason 42,000 sq.ft. of tube surface is used in each condenser. Two pumps are provided to supply 70,000 gal. of circulating water per minute. Condenser tubes are rolled at both ends to prevent the possibility of leakage contaminating the feedwater.

"To meet the requirements of joint ownership the plant has been arranged in units," continued Mr. Wood. "Additions to the American Gas & Electric Company or the United Gas Improvement Company sections may be made without affecting the unit ownership plan. The plant may be extended north or south with equal facility. The Du Pont section is in the middle and the utility



Deepwater Station as It Will Appear When Present Construction Work Is Completed

The building, while one structure, consists essentially of three parts. That on the left is American Gas & Electric Company property, the right section belongs to United Gas Improvement Company and the center section, while owned by A.G.E., is devoted to Du Pont steam and energy requirements.

portions are on either end. Railroad sidings and coal-handling equipment constitute the only exceptions to unit separation."

Two boilers serve each turbine unit, one a standard and the other a reheat boiler, except that for Du Pont two standard boilers are to be used. Each of the six boilers has 9,000 sq.ft. of heating surface and each of the four standard boilers has 18,326 sq.ft. of heating surface in return bend steaming economizers placed directly back of the boiler. Water walls, bare on all four sides of the furnace, have been used. The drums required special design and fabrication procedures and are 50 ft. 3 in. long, 52 in. inside diameter, have walls 4 in. thick and weigh 65 tons. The standard boiler units have a maximum output of 331,000 lb. of steam per hour with an efficiency of approximately 86 per cent. The furnaces are of the flat-bottom, slagging type.

"Pulverized fuel is to be used," Mr. Wood pointed out, "and since all other factors were so nearly identical it was thought that a splendid opportunity was offered for comparative use of bin and unit systems. As the United Gas Improvement Company favored the former and the American Gas & Electric Company the latter, the facilities were so allocated, but the decision to use both systems rested largely upon the desirability of determining relative performances under highly comparable conditions."

The receiving, storing and handling of coal will all be done south of the building, fuel being delivered from boats by means of a movable unloading tower to a storage space near the tower runway. A belt in a tunnel below the pile delivers it to the breakers and ultimately to the station bunker. Storage of about 50,000 tons is provided for the first installation.

The furnaces have been designed for 13,500 B.t.u. per lb. of coal, up to 10 per cent of ash and up to 10 per cent of moisture. The plant is designed, economically, for $4 coal. Preheated air is used in the pulverizers to dry the coal and no coal driers have been provided. The pulverizing equipment has a capacity of 32,000 lb. of coal per hour for each boiler and it is anticipated that more than 1,000 tons of coal a day will be required for the initial installation.

The forced draft fans have been located in the upper part of the station structure, partly because of the heat saving possible, in using the warmer air which collects there. Induced draft fans are also placed at the top of the boiler house.

The auxiliary steam system for the condenser steam jets, soot blowers, priming jets and general service is supplied at suitable pressure from the Du Pont 180-lb. process steam which reduces the amount of make-up water required for the 1,200-lb. system. Feedwater contamination is minimized by reducing losses from the high-pressure steam system. The make-up requirements may be but one-half of 1 per cent.

Feedwater is handled in two stages, the first raising the pressure to 650 lb. and the second to 1,600 lb., or such pressure as may be required for boiler feed. Two sets of pumps are provided for each station unit. The low-pressure pump has a variable speed drive, the second a constant speed. Six stages are used in the first and five in the second. All make-up water is supplied through evaporators to minimize scale and corrosion difficulties.

Fresh air doors are installed over the preheaters, with provisions for both manual and automatic control. The admission of cold air at this point prevents dangerous rise in temperature. The turbine trip-out shuts off the pulverized fuel burners and opens the admission doors on the reheater. The reheaters are designed for a maximum temperature of 775 deg. and the control of this temperature is the element dominating the operation of the reheat boilers.

The wall between the boiler and turbine rooms, which was first omitted at Toronto station of the Ohio River

Major Equipment Data for Deepwater Station

Boilers — Babcock & Wilcox Company. Four Standard boilers, maximum pressure 1,400 lb. per sq.in.; two reheater boilers, maximum pressure 1,400 lb. per sq.in.; heating surface 9,000 sq.ft. per boiler.

Six superheaters, convection type, total temperature 725 deg. F.

Four standard economizers, heating surface 18,326 sq.ft. per boiler.

Two steam reheaters for maximum temperature 775 deg. F., heating surface 25,155 sq.ft. per boiler.

Two reheater economizers, heating surface 4,765 sq.ft. per boiler.

Furnace Data—Fuller Lehigh Company. Unit system — Three boilers; bare tube projected area 1,781 sq.ft. per boiler; blocks 721 sq.ft. per boiler; total furnace volume per boiler 19,080 cu.ft.; B.t.u. per cu.ft. maximum 22,640.

Bin system—Three boilers; bare tube projected area 1,797 sq.ft. per boiler; blocks 342 sq.ft. per boiler; total furnace volume per boiler 19,080 cu.ft.; B.t.u. per cu.ft. max. 22,640.

Pulverized Fuel System (Unit system)—Fuller Lehigh Company. Two 10-ton mills per boiler. Three boilers served.

Pulverized Fuel System (Bin system)—Combustion Engineering Company. One 15-ton mill per boiler. Three boilers served.

Forced Draft Fans — B. F. Sturtevant Company. Six used; 75,000-cu.ft.-per-minute temperature, 80 deg. F. against static pressure of 10 in. at a speed of 1,150 r.p.m.

Induced Draft Fans—B. F. Sturtevant Company. Six used; 150,000-cu.ft.-per-minute temperature, 325 deg. F. against a static pressure of 13 in. at a speed of 860 r.p.m.

Air Preheater for Standard Boiler—Foster Wheeler Corporation. Four used, 54 sections, 90 plates per section; 46,600 sq.ft. heating surface each.

Air Preheater for Reheater Boiler—Foster Wheeler Corporation. Two used; 54 sections, 102 plates per section; 52,800 s.ft. heating surface each.

Boiler Feed Pump, Five Stage Centrifugal—A. S. Cameron Steam Pump Works. Six used, motor driven, 650,000 lb. per hour against 1,600 lb. per sq.in.

Tank Pump, Six Stage Centrifugal—A. S. Cameron Steam Pump Works. Four used, motor driven; 650,000 lb. per hour against 650 lb. per sq.in.

Evaporators for Makeup Water—Griscom Russell Company. Two used; transfer surface 170 sq.ft. each; normal capacity 6,700 lb. steam per hour per evaporator; extreme capacity 12,400 lb. steam per hour per evaporator.

Deaerators—Elliott Company. Two used; normal capacity 400,000 lb. per hour each; overload capacity 425,000 lb. per hour each.

Fifteenth Stage Low-Pressure Heater—Griscom Russel Company. Two used; heating surface 1,850 sq.ft. each; normal full load capacity of each 331,500 lb. of water per hour from 82.5 deg. to 135.7 deg. F.

Tenth Stage High-Pressure Heater—Griscom Russell Company. Two used; heating surface 1,762 sq.ft. each; normal full load capacity of each will be 437,300 lb. water per hour from 210 deg. to 244 deg. F.

Sixth Stage High-Pressure Heater—Griscom Russell Company. Two used; heating surface 1,970 sq.ft. each; normal full load capacity of each will be 437,300 lb. water per hour from 244 to 311 deg. F.

Crossover High-Pressure Heater—Griscom Russell Company. Two used; heating surface 2,165 sq.ft. each; normal full load capacity of each will be 437,300 lb. water per hour from 311 to 395.2 deg. F.

Turbo-Generators—General Electric Company. Two cross-compound turbo-generator sets, total capacity of 53,000 kw. each with direct-connected exciters; one 12,500 kw. turbine non-condensing with direct-connected exciter.

Condensers—Foster Wheeler Corporation. Two used; condensing surface 42,500 sq.ft. each; each condenser to condense 370,000 lb. steam per hour.

Circulating Water Pumps—Foster Wheeler Corporation. Four used, motor driven; capacity each 35,500 gal. per minute against a total dynamic head of 16 ft.

Condensate Pump—Foster Wheeler Corporation. Four used; capacity of each 900-gal. per minute against a total dynamic head of 40 ft.

Du Pont Unit Equipment

Evaporators—Griscom Russell Company. Seven used; heating surface of each 4,430 sq.ft.; normal duty; six evaporators to produce 250,000 lb. per hour of vapor at 215 lb. absolute when evaporators are supplied at 270 lb. absolute.

Evaporator Feed Pump—Three-Stage De Laval—Turbine Equipment Company. Two used; capacity 1,070 gal. per minute of water at 180 deg. F.

Evaporator Safety Valves—Crosby Steam Gage & Valve Company. Twenty-one used; capacity 33,950 lb. per hour each.

Evaporator Superheater—Foster Wheeler Corporation. Two used; heating surface 1,250 sq.ft. each.

Evaporator Drip Pump—Four-Stage Centrifugal—A. S. Cameron Steam Pump Works. Seven used; capacity of each 110,000 lb. of water per hour at 428 deg. F.

Gland Steam Condenser—Griscom Russell Company. One used; transfer surface 735 sq.ft.

Edison Company and subsequently elsewhere, has also been eliminated here, thus improving ventilation, light and supervision.

All switchboards will be located on the third floor of the service building, approximately 22 ft. above the turbine room floor. The generator and feeder panels will be of the vertical type instead of the usual bench boards. This board will be arranged symmetrically about the medial line. The control of the Du Pont unit will be placed in the United Gas Improvement Company side of the center line. Auxiliary boards for the regulators, graphic temperature recorders, battery controls and recording meters will be duplicated for each half of the station and will be arranged at opposite ends of the main control board. These will all be of the standard vertical type. On the floor directly under the switchboard will be located the terminal boards of all control cables mounted on suitable racks. On this floor will also be located the storage batteries, charging sets and special telephone equipment.

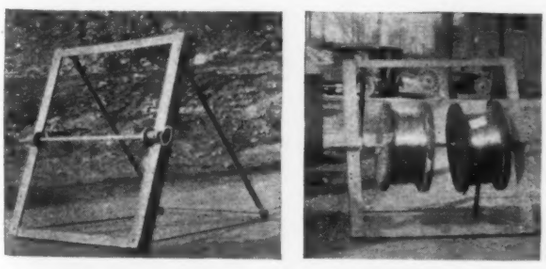
Properly to allocate the costs of steam generation, as differentiated from power generation, to the three companies, special metering of all boiler room auxiliaries has been provided for each group.

All auxiliary equipment will be motor driven. There will be no provision for house turbines, as there will be reliable power supply from the interconnected lines of the American Gas & Electric Company and the United Gas Improvement Company systems. There will be provisions also for auxiliary power from the Du Pont bus and also a special transformer connected between the 11-kv. and 66-kv. systems, with a third winding supplying the 2.3-kv. auxiliaries. Auxiliary motors will operate at 2,300 volts and 550 volts, all motors less than 125 volts horsepower using 550 volts.

Stevens & Wood, Incorporated, who were employed by the joint owners and are responsible for the design and construction of this station, retained as their consultants Sargent & Lundy, Inc. E. M. Gilbert, chief engineer of W. S. Barstow & Company, Inc., was retained as arbitrator for the American Gas & Electric Company and the United Gas Improvement Company.

The deliveries of material and the progress in the field indicate that this plant will be ready to go into service in November of this year.

Collapsible Reel Frame Saves Space on Truck

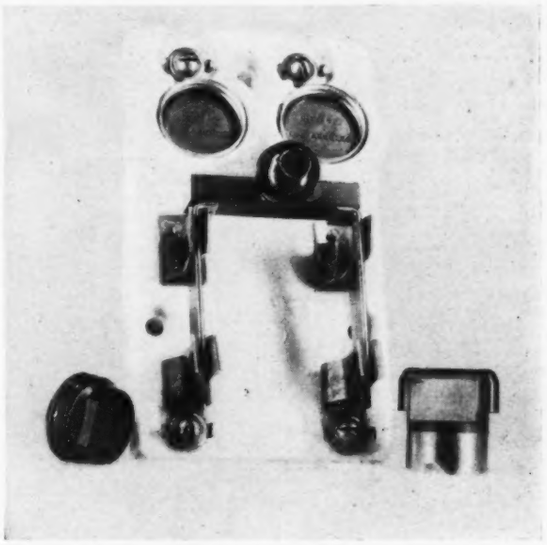


A SQUARE frame of angle steel with light bracing members hinged so that they will fold into the side angles is used as a reel frame by the Dayton (Ohio) Power & Light Company. The cross bar is a discarded Ford driveshaft with a handle welded to one end for pulling it out of the bearings, which are also old Ford parts. The bearings are welded to the angle frame. A feature of this device is that the shaft may be put through the reels of wire as they rest on the ground. The frame then gives a two-to-one lever lift on the reels as they are raised.

Electric Services Sealed by Simple Device

By O. W. Holden
Junior Electrical Engineer
Department of Water and Power, City of Los Angeles

WHEN an electric utility temporarily disconnects a service by removing the fuse plugs and sealing the entrance switch open it is comparatively easy for a new tenant or delinquent customer to restore his own service without applying to the utility. More effective means



Bakelite Plug Prevents Customer from Restoring His Own Service

Plug is shown at left and special wrench at right of this switch, in which two plugs have been inserted.

of preventing restoration of service, such as cutting the service at the pole or at the building, is expensive and often impracticable, particularly when more than one customer is connected to the same service.

In studying the problem, the Department of Water and Power of Los Angeles developed a lockout plug which is simply a single piece of molded Bakelite or similar material designed to be screwed into the fuse receptacle of the service switch by means of a special socket wrench. The wrench socket and the portion of the plug with which it fits are circular except for a small flat space on the rim which forms the means of engagement between the two. When set, the top of the plug is below the rim of the receptacle, and as the circular top is only slightly smaller than the inside of the receptacle, it is almost impossible for the ordinary householder to remove the plug.

Frequently the plug and the receptacle have been found ruined for future service without the plug becoming dislodged after some unauthorized person had unsuccessfully attempted to reconnect his service and then was obliged to call the order clerk. Further advantages are the absence of any mechanism and the absolute safety to the person handling the plug, the wrench handle being of insulating material. Originally intended to be used only in cases of delinquent consumers, the low cost of the plug and its effective results have extended its use to all services when temporarily discontinued. A patent has been applied for.

Intensities Recommended for General Industrial Illumination

(Franklin Specification, Society for Electrical Development)

	Foot-Candles Recomd.	Foot-Candles Req. Min.
Aisles, Stairways, Passageways	3	2
Assembling		
Rough	8	5
Medium	12	8
Fine	20	12
Extra fine		†
Automobile Manufacturing		
Automatic screw machines	15	10
Assembly line	15	10
Frame assembly	12	8
Tool making	20	12
Body manufacturing—		
*Assembly, finishing and inspecting		†
Bakeries	12	8
Book Binding		
Folding, assembling, pasting, etc	8	5
Cutting, punching and stitching	12	8
Embossing	15	10
Candy Making	12	8
Canning and Preserving	12	8
Chemical Works		
Hand furnaces, boiling tanks, stationary driers, stationary or gravity crystallizing	5	3
Mechanical furnaces, generators and stills, mechanical driers, evaporators, filtration, mechanical crystallizing, bleaching	6	4
Tanks for cooking, extractors, percolators, nitrators, electrolytic cells	10	6
Clay Products and Cements		
Grinding, filter presses, kiln rooms	5	3
Molding, pressing, cleaning and trimming	8	5
Enameling	10	6
Color and glazing	15	10
Cloth Products		
Cutting, inspecting, sewing—		
Light goods	15	10
Dark goods		†
Pressing, cloth treating (oil cloth, etc.)—		
Light goods	12	8
Dark goods	20	12
Coal Breaking and Washing, Screening	5	3
Construction		
Indoor general	5	3
Dairy Products	12	8
Electric Manufacturing		
Storage battery, molding of grids, charging room	10	6
Coil and armature winding, mica working, insulating processes	20	12
Elevator—Freight and Passenger	9	5
Engraving		†
Forge Shops and Welding	10	6
Foundries		
Charging floor, tumbling, cleaning, pouring and shaking out	8	5
Rough molding and core making	10	6
Fine molding and core making	15	10
Garage—Automobiles		
Storage—		
Dead	3	2
Live	8	5
*Repair dept. and washing	15	10
Glass Works		
Mix and furnace rooms, pressing and Lehr glass blowing machines	10	6
Grinding, cutting glass to size, silvering	12	8
Fine grinding, polishing, beveling, inspection, etching and decorating	15	10
*Glass cutting (cut glass), inspecting fine		†
Glove Manufacturing		
Light Goods—		
Cutting, pressing, knitting	12	8
Sorting, stitching, trimming and inspecting	15	10
Dark Goods—		
Cutting, pressing, knitting	15	10
Sorting, stitching, trimming and inspecting		†
Hat Manufacturing		
Dyeing, stiffening, braiding, cleaning and refining—		
Light	10	6
Dark	15	10
Forming, sizing, pouncing, flanging, finishing, ironing—		
Light	12	8
Dark	15	10
Sewing—		
Light	15	10
Dark		†
Ice Making		
Engine and compressor room	10	6
Inspecting		
Rough	10	6
Medium	15	10
*Fine	25	15
*Extra fine		†
Jewelry and Watch Manufacturing		†
Laundries and Dry Cleaning	12	8
Leather Manufacturing		
Vats	5	3
Cleaning, tanning and stretching	6	4
Cutting, fleshing and stuffing	10	6
Finishing and scarfing	15	10
Leather Working		
*Pressing, winding and glazing—		
Light	12	8
Dark	15	10
Grading, matching, cutting, scarfing, sewing—		
Light	15	10
Dark		†
Locker Rooms	6	4
Machine Shops		
*Rough bench and machine work	10	6
*Medium bench and machine work, ordinary automatic machines, rough grinding, medium buffing and polishing	15	10
*Fine bench and machine work, fine automatic machines, medium grinding, fine buffing and polishing	20	12
Extra fine bench and machine work, grinding (fine work)		†
Meat Packing		
Slaughtering	8	5
Cleaning, cutting, cooking, grinding, canning, packing	12	8
Milling—Grain Foods		
Cleaning, grinding and rolling	8	5
Baking or roasting	12	8
Flour grading	25	15
Offices		
Private and General—		
Close work	15	10
No close work	10	8
Drafting room	25	15
Packing		
Crating	6	4
Boxing	10	6
Paint Manufacturing	10	6
Paint Shops		
Dipping, spraying, firing	8	5
Rubbing, ordinary hand painting and finishing	12	8
Fine hand painting and finishing	15	10
*Extra fine hand painting and finishing (automobile bodies, piano cases, etc.)		†
Paper Box Manufacturing		
Light	10	6
Dark	12	8
Storage of stock	5	3
Paper Manufacturing		
Beaters, machine, grinding	6	4
Calendering	10	6
Finishing, cutting and trimming	12	8
Plating	8	5
Polishing and Burnishing	12	8
Power Plants, Engine Rooms, Boilers		
Boilers, coal and ash handling, storage battery rooms	5	3
Auxiliary equipment, oil switches and transformers	8	5
Switchboard, engines, generators, blowers, compressors	10	6
Printing Industries		
Matrixing and casting, miscellaneous machines, presses	12	8
Proof reading, lithographing, electrotyping	15	10
*Linotype, monotype, typesetting, imposing stone, engraving		†
Receiving and Shipping	6	4
Rubber Manufacturing and Products		
Calendars, compounding mills, fabric preparation, stock cutting, tubing machines, solid tire operations, mechanical goods building, vulcanizing	12	8
Bead building, pneumatic tire building and finishing, inner tube operation, mechanical goods trimming, treading	15	10
Sheet Metal Works		
Miscellaneous machines, ordinary bench work	12	8
Punches, presses, shears, *stamps, welders, spinning, fine bench work	15	10
*Tin plate inspection		†
Shoe Manufacturing		
Hand turning, miscellaneous bench and machine work	12	8
Inspecting and sorting raw material, cutting, lasting and welting (light)	15	10
*Inspecting and sorting raw material, cutting, stitching (dark)		†
Soap Manufacturing		
Kettle houses, cutting, soap chip and powder	8	5
Stamping, wrapping and packing, filling and packing soap powder	10	6
Steel and Iron Mills, Bar, Sheet and Wire Products		
Soaking pits and reheating furnaces	3	2
Charging and casting floors	6	4
Muck and heavy rolling, shearing, rough by gage, pickling and cleaning	8	5
Plate inspection, chipping	25	15
Automatic machines, rod, light and cold rolling, wire drawing, shearing, fine by line	12	8
Stone Crushing and Screening		
Belt conveyor tubes, main line shafting, spaces, chute rooms, inside of bins	3	2
Primary breaker room, auxiliary breakers under bins	5	3
Screen rooms	8	5
Store and Stock Rooms		
Rough bulky material	3	2
Medium or fine material requiring care	8	5
Structural Steel Fabrication	10	6
Sugar Grading	25	15
Testing		
Rough	8	5
Fine	15	10
Extra fine instruments, scales, etc		†
Textile Mills		
(Cotton)—		
Opening and lapping, carding, drawing-frame, roving, dyeing	8	5
Spooling, spinning, drawing-in, warping, weaving, quilling, inspecting, knitting, slashing (over beam end)	12	8
(Silk)—		
Winding, throwing dyeing	12	8
Quilling, warping, *weaving and finishing—		
Light goods	15	10
Dark goods	20	15
(Woolen)—		
Carding, picking, washing, combing	6	4
Twisting and dyeing	10	6
Drawing-in, warping—		
Light goods	10	6
Dark goods	15	10
*Weaving—		
Light goods	12	8
Dark goods	20	12
Knitting machines	15	10
Tobacco Products		
Drying, stripping, general	3	2
*Grading and sorting	25	15
Toilet and Wash Rooms	6	4
Upholstering		
Automobile, coach and furniture	15	10
Warehouse	3	2
Woodworking		
Rough sawing and bench work	8	
Sizing, planing, rough sanding, medium machine and bench work, gluing, veneering, cooperage	12	
Fine bench and machine working, fine sanding and finish	15	10

* In interiors marked with asterisk (*) other factors such as the direction of light, its color quality or the type of the fixture, are of unusual importance and require special study.

† In interiors marked with dagger (†) the level of illumination required is so high, usually 50 to 100 foot-candles, that individual lamps are ordinarily supplied for each operation in addition to a general room illumination of 10 foot-candles or more.

Industry Plans

National Homage to Edison

With 50th anniversary of incandescent lamp as the occasion, entire country plans to pay unprecedented tribute to a living man for what he is and has accomplished. To create a national industrial hero in "Light's Golden Jubilee"

PLANS for paying nation-wide and what may become world-wide homage to Thomas A. Edison were presented May 2 and 3 at Nela Park, Cleveland, to a group of utility men from various parts of the country. The celebration, known as "Light's Golden Jubilee," will be opened on a most spectacular scale at the Atlantic City convention of the N.E.L.A. and will continue throughout the summer, culminating in a grand climax centering at Dearborn, Mich., October 21. It will represent the biggest tribute ever paid to a living man. National and international recognition will be given to his many contributions to civilization, particularly the incandescent lamp, developed 50 years ago this year. He will be honored as a distinctly new type of American hero—an industrial hero of the workbench, symbolizing inspiration, imagination, research, perseverance, versatility and outstanding achievement.

As N. H. Boynton explained at this meeting, the idea originated with the Edison Pioneers, who felt that it would be most fitting this year to honor their hero by having a national commemoration of the 50th anniversary of the incandescent lamp. This thought rapidly developed into an electrical industry movement, receiving the support of all electrical organizations, but now has expanded into a plan which will include the whole country because of the far-reaching benefits which civilization and industry have derived from Mr. Edison's contributions and because of the inspiration which he may be to youth and the humblest worker.

President Herbert Hoover has consented to act as honorary chairman of the sponsoring committee, composed of national celebrities. In accepting this post President Hoover said that he associated himself with Light's Golden Jubilee as a personal tribute to the genius of a great national benefactor—Thomas A. Edison. National committees have been established to plan a national celebration and arrangements are being made to aid in individual communities which may wish to tie in with this event throughout the summer or this fall.

In the first manifestation of the jubilee, at Atlantic City, light will be applied in all its brilliance, color and glamor to decorating the boardwalk, surf, hotels, streets, auditorium and sky. Effects are promised which have no precedent and which are unlikely to be reproduced in their entirety again, but they will serve to indicate what can be done elsewhere on a smaller scale throughout the summer. On June 6 a special celebration will be held in the new auditorium, at which Mr. Edison will be the central figure. Throughout the summer various cities are planning to have unusual lighting celebrations and events in which light will play a spectacular part, such as illuminated night air derbies, illuminated air parades, etc. It is intended to help any community, no matter how small, if it desires to participate.

The climax at Dearborn, October 21, will start with an invitation dinner given by Henry Ford to international celebrities, with Thomas Edison as the honored guest. It will be held in the Ford Museum of Industrial Development, where Edisonia are enshrined and to which Edison's Menlo Park laboratory and workshop have been moved. Here also has been erected a full-size replica of Independence Hall, but in the position corresponding to that which the original historic building devotes to the Liberty Bell stands a statue of Edison—the liberator of mankind through his contributions. On this occasion Mr. Ford will donate the Edison School of Technology, intended chiefly for boys who cannot afford to go to college. Amid the scenes of 50 years ago Edison will re-enact the development of the first

incandescent lamp and the starting of his dynamo. All these events will be radio broadcast over a national and international hook-up by Graham MacNamee. Then other announcers in airplanes over various cities will describe their impressions of the lighting celebrations below. Plans are also being completed to broadcast tributes to Edison from rulers abroad. This will, therefore, be the first opportunity for all radio receiver owners to hear voices from across the sea.

Mr. Boynton pointed out that civic organizations and merchants will be invited to participate in the national celebration. Since this event is the golden anniversary of the incandescent lamp, participants will be urged to use light as the major medium of celebration, although other forms of commemoration can be used, such as addresses on Edison, his characteristics and his accomplishments, historical displays, etc.

After this general outline of the purpose of the celebration A. L. Powell gave an illustrated address pointing out that colored views of new or novel uses of lighting can be effectively used to show civic organizations and merchants how they can celebrate with light. He reminded his audience that most communities have natural scenery, historic buildings, parks or the like that can be made the focal point of illumination, but that since most merchants and civic organizations will be interested in equipping their buildings and streets with special lighting effects, precautions should be taken to assure a harmonious blend. He recommended placing emphasis on light with a golden glow to commemorate the 50th anniversary and described ways in which it can be done with spray, dips, color caps, screens, glass cylinders, etc., if it is undesirable to purchase special golden-glow lamps. Among forms of lighting to use he included festoons, illuminated jewels and patterns, illuminated smoke and steam beacons using color, floodlighting, aurora borealis effects, artistic outline lighting, illuminated toy balloons, etc. Floodlighting, he pointed out, can be applied not only to buildings and monuments but to gardens, fountains and trees. Bridges, building exteriors, show windows, monuments and public squares, dancehalls, streets, etc., afford attractive opportunities, for spectacular lighting. S. E. Doane cited the German experience during the Lichfest, that where two or more centers of interest are illuminated they should be connected with illumination to keep the crowds moving and to interest the merchants in participating.

Considerable time was devoted in the Nela Park meeting to discussing working arrangements for carrying out the celebration plans, T. O. Kennedy acting as chairman of this activity. He again warned against any commercialization of the celebration, reminding that the purpose of Light's Golden Jubilee is to pay a tribute to Edison and create an industrial hero as contrasted with war or political heroes. It was emphasized that utilities will be called upon largely to initiate the movements in each locality, and that the effectiveness of the celebration will depend on the responsibility which each individual assumes and discharges.

A plan book was discussed which includes the sponsoring committee, the idea back of the celebration, suggestions for celebrating, colored illustrations of possible lighting effects and materials available to each community. Suggestions will be included for organizing locally. The "Light's Golden Jubilee" committee expects to make this plan book available very shortly. Among materials available to participants will be replicas of Edison's first lamp, reprints of an 1879 issue of the New York *Herald* which announced Edison's invention, rotogravure prints of Edison, historical material regarding Edison, motion pictures portraying in human interest manner his boyhood days, experiences, characteristics and achievements that make him a genius and worthy of emulation.

Dr. Charles A. Eaton, U. S. Congressional representative from New Jersey, emphasized the spiritual or inspirational side of the celebration and warned that the greatest value can be obtained by avoiding all commercialism in planning and conducting it. He urged keeping foremost the genius of America, symbolic of American opportunity and achievement, the man who has done more than any one else in the last 50 years to lift drudgery from the household and the factory and to promote progress.

Arrangements for co-ordinating publicity were outlined by Harold Green, who also called attention to national advertising and effectively demonstrated what a radio listener might hear on the night of October 21. Organization plans for conducting the public speaking which will be required during this celebration were outlined by W. M. Skiff, who indicated various types of groups before which speeches will have to be made, the personnel from which speakers can be drawn and the material available for speakers. It was announced that the N.E.L.A. public speakers' bureau and local electrical leagues will constitute the chief sources of speakers, although assistance will be solicited from any available sources. Typical addresses are being prepared and outlines of material which can be worked into speeches have been made available in card form.

Throughout the two days' discussion devoted to these plans many speakers emphasized the necessity of eliminating all commercialism from the programs and urged the featuring of Edison's development of the incandescent lamp and his other contributions to civilization, their significance to civilization, and particularly his characteristics, which make him a new type of American

Sponsoring Committee

(Includes only acceptances up to press time)

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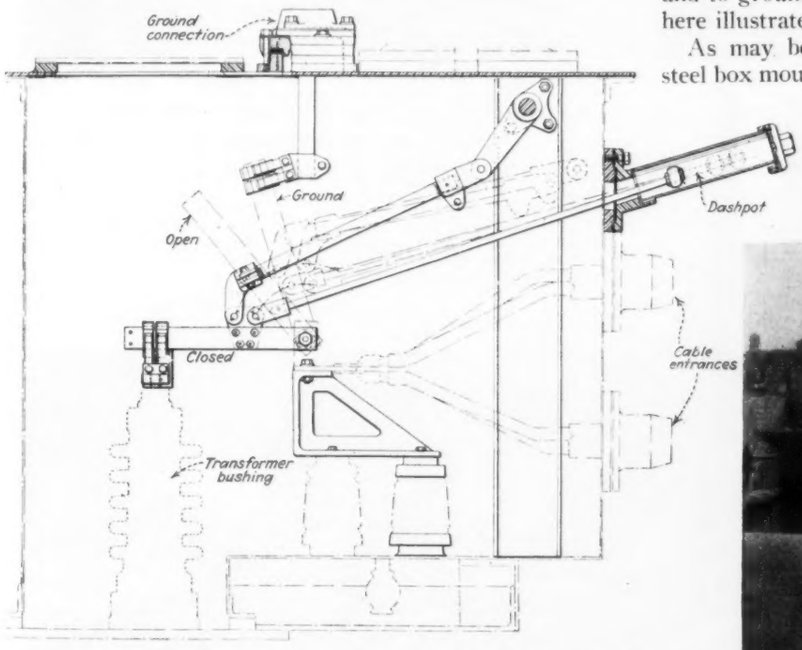
hero. J. Paul Clayton, vice-president and a director of the Central Illinois Public Service Company, who particularly championed this broad viewpoint in celebration, conceded the use of light to be a particularly appropriate form of celebration in view of the 50th anniversary of the incandescent lamp, but reminded that it should not be considered to the exclusion of other media. Furthermore, he pointed out that Edison's versatility disproves that he can be claimed by one electrical industry and urged that his other achievements should be brought out. He maintained that the test of the suitability of any celebration should be whether it emphasizes the man, his character and achievements or merely attracts attention to the instrumentality of expression.

Several utility men admitted that utilities would have to share a large portion of the burden, but that merchants and other business men should be interested in participation because of the obvious benefits to themselves. What can be done in the smaller towns was of particular interest. It was recognized that utilities' first responsibility is in acquainting their own employees with the plan and its purpose. The need of a clearing house for methods of conducting celebrations was expressed. And, finally, it was emphasized that although schools would be interested in Edison, his achievements and his character, it would be inadvisable to bring anything before school children except upon request from school authorities so there will be no occasion for public criticism. Even when material is presented to schools it was urged to avoid submitting anything which could possible be interpreted as propaganda.



Distributes Booklet for Farmers

FARMERS residing in the territory served by the Detroit Edison Company have recently received a 42-page pamphlet explaining in easily comprehensible terms the benefits to be derived from electric service and the manner in which the farmer should go about securing these benefits. Definite suggestions are given on wiring the home and farm buildings and dealing with contractors. Different kinds of wiring, appliances, equipment and lighting fixtures are described.

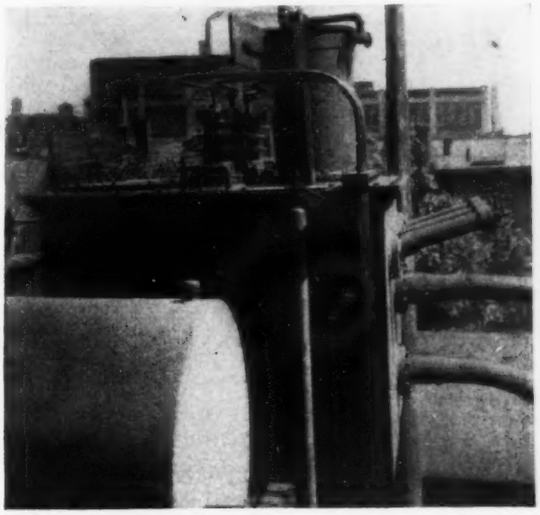
The nature of the company's farm-service organization and its policies are explained. Information is also included on common electrical terms and on how to read meters and figure bills. The book has a particular appeal for the farmer by the fact that it is printed, including the cover stock, on cornstalk paper, which is already being produced by a number of Michigan paper mills.

High-Voltage Pothead Reduces Station Equipment

IN THOSE substations serving residential areas only it is the practice of the Detroit Edison Company to bring the 24,000-volt feeders directly to the step-down outdoor transformers and to have no buses or switching at this voltage in the substation building. Since it is necessary at times to cut the transformers off the feeders and to ground the feeder ends the disconnecting pothead here illustrated was devised.

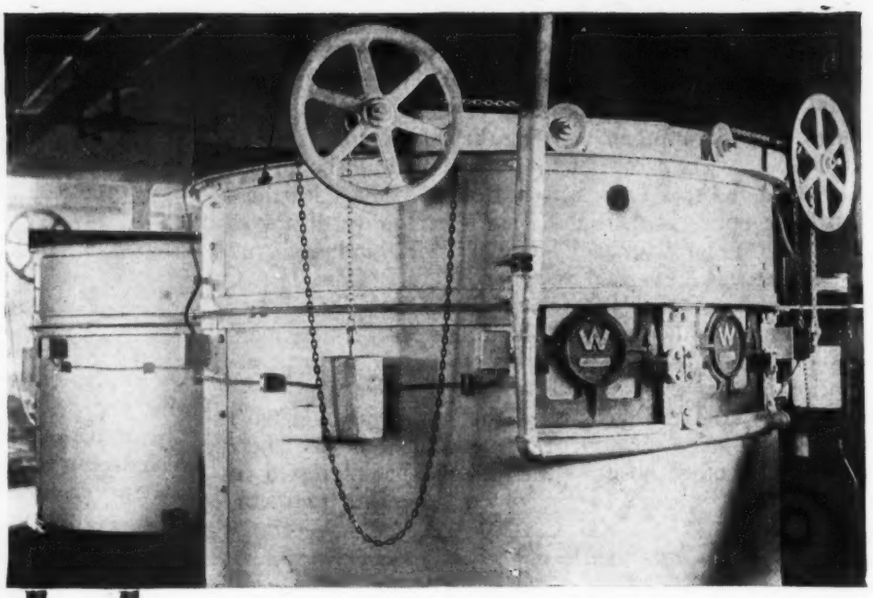
As may be seen, the pothead is a rectangular sheet steel box mounted over the transformer primary bushings, which, fitted with switch clips, become parts of the operating mechanism. The parallel 24,000-volt cables are brought into the side of the box and their conductors terminate on the hinge ends of a gang-operated disconnecting switch, the free blade ends of which may enter the clips on the transformer bushings, may remain open or may contact the ground clips at the top of the box according as the operating handle is in the "closed," "open" or "ground" position. The switch is operated from the ground by means of a rod connection.

Disconnecting and Grounding Pothead for Transformer



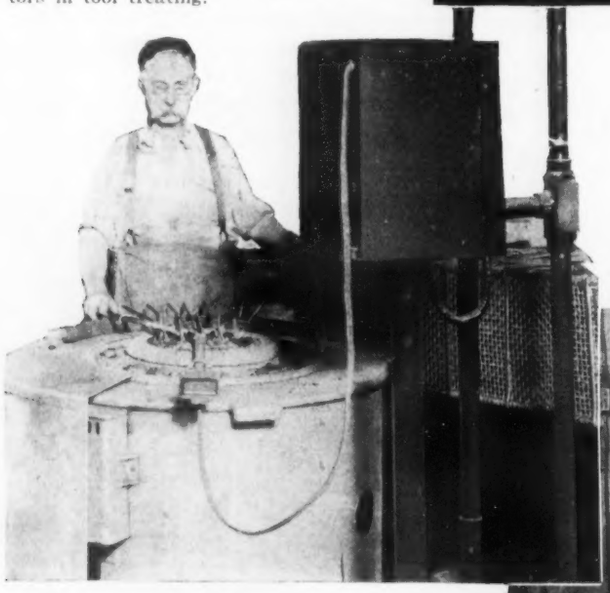
In order to prevent too rapid movement of the mechanism, which might carry the switch blades dangerously beyond the open position, three dashpots, one to each switch blade, are included in the design. These dashpots are open to the inside of the pothead and, like it, are filled with oil. Fairly close clearances between the dashpot pistons and the glass cylinders, in which they move effectively, prevent anything faster than deliberate operation of the switch. The operating handle moves over a semi-circular guide which is drilled so that the handle may be locked in any of the three positions.

ELECTRIC HEAT IMPROVES QUALITY OF SMALL TOOLS



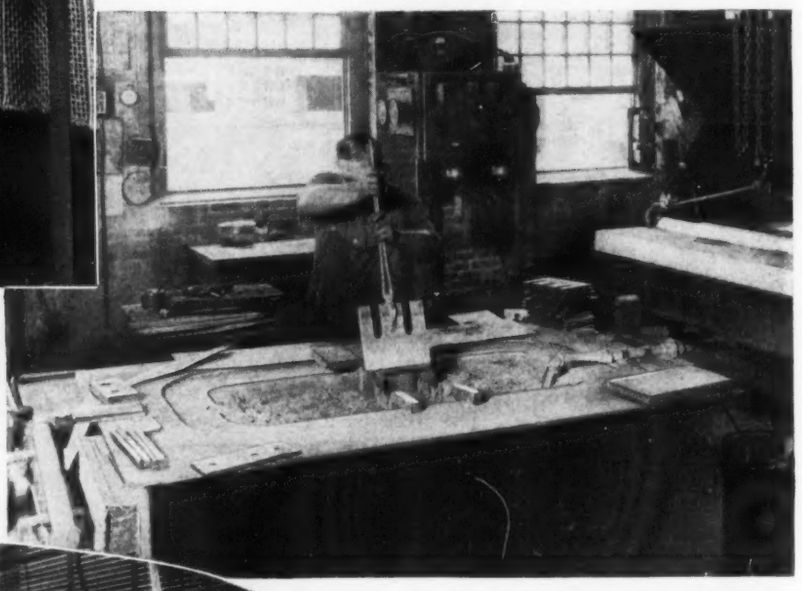
Only One Edge of Tools Hardened and Tempered in This Pot Type Furnace

Note that the heat treater is working almost directly over the furnace without any apparent discomfiture. Ideal working conditions, uniformity of product, increased production, and decrease of maintenance expense are important factors in tool treating.



Circular Conveyor Type Furnace for Hardening and Tempering Flat Cutlery

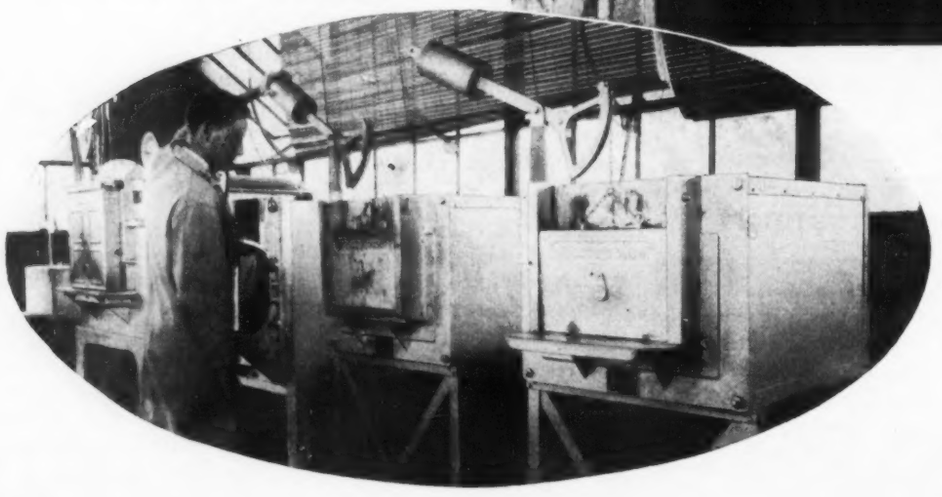
Also adaptable to treating small parts such as wrenches, bolts, nuts, cap screws, etc., which are not adaptable to being pushed through furnace. Definite timing action and positive heat distribution give accurate results day after day.



These Electric Furnaces Assure Exact Temperature

(Black & Decker Company)

Unless there is positive assurance of a uniform temperature through the chamber of a furnace treating small tools such as drills, taps, reamers, etc., each piece must subsequently be tested to obtain uniformly high-grade product.



Uniform Temperature of This Bath Type Furnace Increased Production

(Henry Disston & Sons)

To obtain high quality with fuel furnaces requires expert heat treaters and exceptional care in inspecting and testing the product.

Electric Heat Treating

Benefits Evaluated

Net value equivalent to 56 per cent return on investment for specific case. Five advantages individually offset 30 to 128 per cent of fuel cost

By WIRT S. SCOTT

Special Representative Westinghouse Electric & Manufacturing Company

IN THE development of any new field or industry generalization of all the various advantages is indulged in, for want of concrete evidence and facts. As the art develops, helpful data become available, which, plus a better understanding of the problems involved, enable one to predict with a greater degree of accuracy the results to be obtained. In other words, the so-called intangible advantages become tangible.

A great number of persons have been speaking of the intangible advantages resulting through the use of electric heating, and while many have been convinced that electric heating is economical for their particular process, there is still a large number who get no farther than a comparison of the fuel bill versus the electric power bill.

In connection with almost any kind of heat-treating proposition it should be possible to prepare a report showing the value of electric heating in practically every possible phase and assign a value to each item covered in the report, such as can be justified.

Manufacturing companies knowing in detail their operating costs are in a position to place a value on the so-called intangible advantages of electric heating. It is due to this thorough knowledge of their problems that so many make the statement that they would not return to the use of fuel if they got their gas or oil for nothing. Also, that they would continue to use electricity for heat treatment if it cost four or five times as much as it does at present.

Table I—Conditions on Which Analysis Is Based

Hourly production, lb.	1,000
Kind of heat treatment	Hardening and tempering
Hardening temperature, deg. F.	1470
Drawing temperature, deg. F.	570
Hours operated per month	208
Monthly production, lb.	208,000
Fuel, natural gas (1,000 B.t.u.), cents per thousand	60
Electric power cost, cents per kilowatt-hour	1½
Rejects due to inaccurate heat treatment, per cent	25
Average weight per tool, lb.	1
Average sales value per tool	$1.00
Sales value per month	$208,000.00
Gas cost per month	$161.86
Electric power cost per month	$343.20

In the final analysis the decision as to the kind of energy to use must be made on the basis of the economics of the proposition. The use of fuel or electricity is an economic problem. The source of energy that will produce the quality of product desired at the lowest ultimate cost, taking into consideration all factors entering into costs, is the kind that should be used.

Take, for example, a case where a manufacturer is already producing a high-grade product with fuel equipment. The product under consideration consists of wrenches of all kinds, pliers, etc. The difference in sales price between a heat-treated wrench and one not heat treated is approximately 30 per cent of sales price.

In order to demonstrate the small part the cost of fuel plays in the cost of the completed product we will assume that the manufacturer uses natural gas, costing 60 cents for 1,000 cu.ft. It is also assumed that electric power is available at 1½ cents per kilowatt-hour.

This manufacturer was primarily interested in maintaining a high-grade quality of product, improving the quality if possible, provided such could be done economically, and reducing over-all production costs.

IMPROVEMENT IN QUALITY

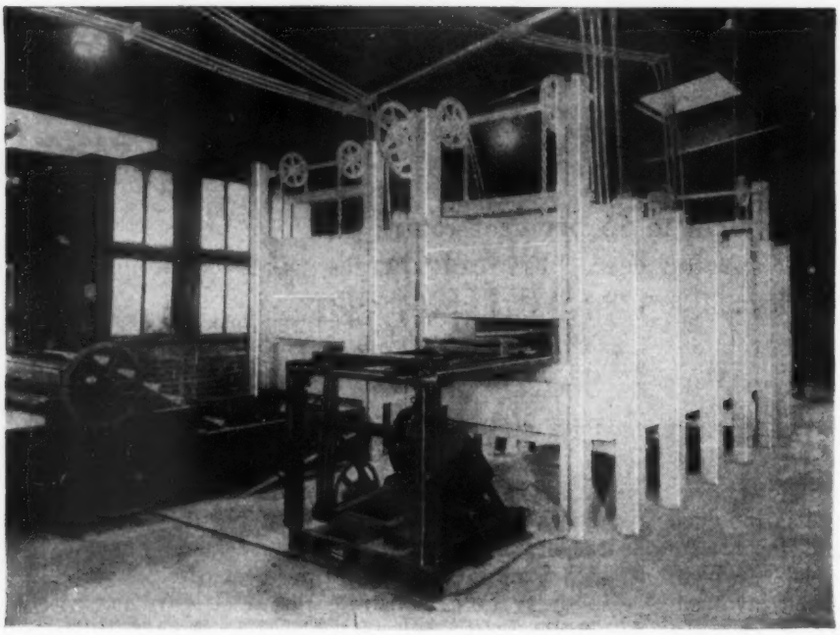
Assuming that the manufacturer is producing a quality of product the equal of any on the market, the quality is obtained by reason of high-grade fuel furnace equipment, expert heat treaters and very rigid inspection and testing of the heat-treated materials.

It is known that by means of electric heating new standards of quality have been produced, and if this result can be reached where a manufacturer desires the best that can be obtained from a given piece of steel it should be worth some small amount, due to increased sales, even if a higher price cannot be secured for the finished article. For a tool selling at $1 each, it is not unreasonable to suppose that a better quality would be worth one-tenth of a mill increase on the factory cost, or a total increased monthly cost on a production of 208,000 tools of $20.80, which is credited as a saving due to increased sales without an increased advertising and sales expense.

Some may inquire as to what assurance there is of producing a higher-grade quality. The first prerequisite of exact heat treatment is that all of the heat-treated parts be subjected to exactly the same conditions in respect to rate of heating, maximum temperature and rate of cooling. Any variation, change or difference in these conditions will result in a corresponding decrease in the quality. An electric furnace can be so designed as to liberate heat uniformly to the charge, at a definite rate, and to produce a definite temperature rise in the charge each minute. Once these conditions are attained they are definitely fixed and not subject to variation. The temperature throughout the furnace is controlled so it is practically uniform, in many cases differing not more than 5 deg. F. In fuel-fired furnaces the variation may be 50 to 100 deg. between the thermocouple and other points of the furnace.

In every heating installation where fuel, in any form,

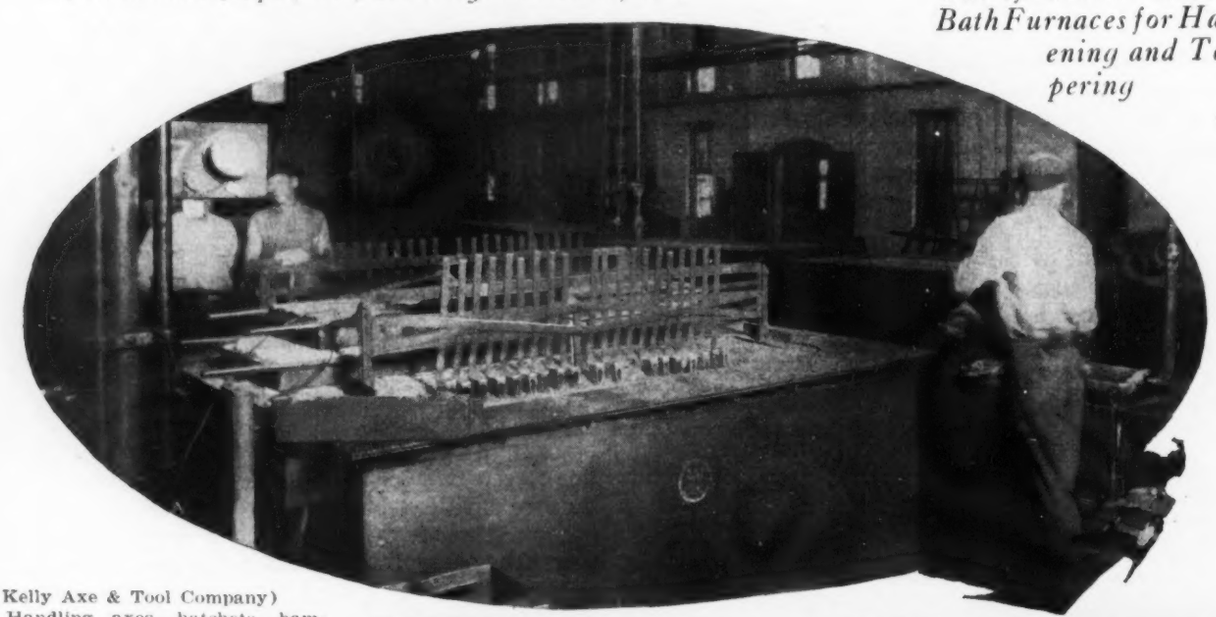
HARDENING AND TEMPERING ELECTRICALLY



The temperature of the 177-kw. hardening furnace at the left as well as the speed of the corresponding conveyor are adjustable to the weight and kind of product. Work from the hardening furnace is automatically quenched, removed from the quench tank by the conveyor and placed on conveyor of 120-kw. tempering furnace (at right), where the heat treatment is automatically completed.

Pusher Type Furnaces Hardening and Tempering Small Axes, Spindles, Steering Knuckles, etc.

One of 25 Electric Lead-Bath Furnaces for Hardening and Tempering



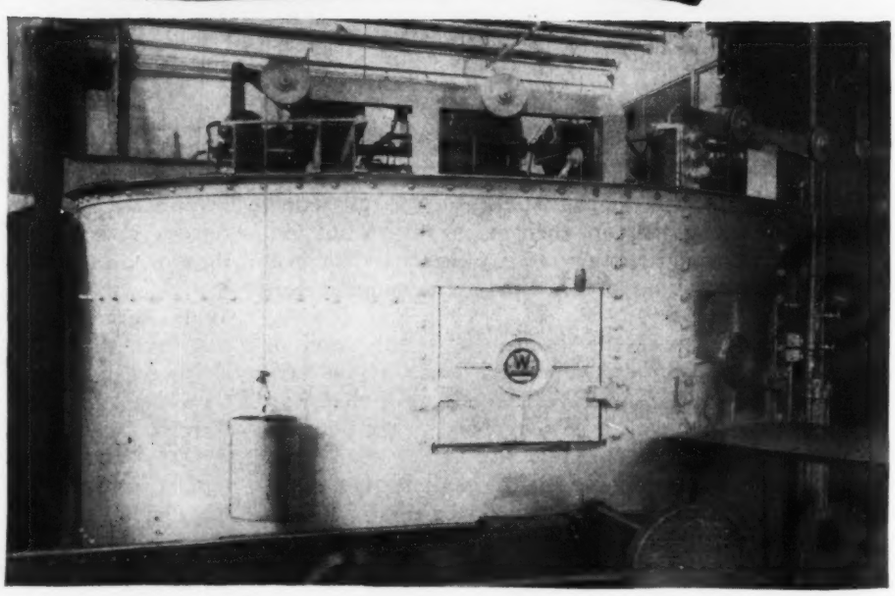
(Kelly Axe & Tool Company)

Handling axes, hatchets, hammers, etc. Rejects were reduced from 25 per cent to practically nothing; one-third the former heat-treating labor is used and the present help is less expensive; electricity used in competition with 18-cent natural gas; maintenance only 10 per cent of former expense; superior product obtained; working conditions and plant appearance vastly improved.

Rotary Hearth Furnace Hardening Ball-Bearing Races

(Martin Rockwell Company)

Released five men in hardening room and two from inspection and testing (the latter because of accuracy of electric heat treating); 10,000 consecutive pieces without a single rejection indicates uniformly high-grade results. Speed of hearth can be varied to give saturation of charge and allow exact timing cycle. Charge is automatically discharged into quench bath.



is being used there are two inseparable major problems involved, combustion and heat treating. The difficulty of controlling the combustion and resulting temperature conditions inherent in the furnace design, together with the ensuing deterioration, imposes a superhuman task on the heat treater, regardless of how skilled he may be. This results in an unnecessarily large percentage of rejects, where a high-grade uniform product is required, or in a low standard of quality as compared to that which is obtainable by the use of electrical equipment.

Electrically heated apparatus presents no combustion or temperature problems within the range of materials available to date, hence that part of the heat treater's troubles are at once eliminated. The remaining problem, heat treating, ceases to be a problem at all, but becomes an exact science of the simplest possible form, permitting an unskilled laborer with absolutely no knowledge of heat treating to produce a product superior to the highest grade heat treater who is operating fuel-fired equipment and to reproduce such results, day after day, with a minimum of spoilage or rejects.

Dependable and Increased Production

In a plant having an average of 25 per cent in rejects, with the daily rejects varying from 15 to 35 per cent, it is advantageous to be able to predict in advance the date on which an order will be completed and new work undertaken. Manufacturers will place different valuations upon the value of this. In this case a value of $10 per month is placed on this item.

Eliminating the rejects due to heat treatment means 25 per cent less stock on the floor at all times. The investment represented by this excess stock, plus the space occupied by its daily accumulation, can be determined and in many cases may reach the astonishing figure of $50.

It is to be noted that three electric furnaces of the same hearth dimensions will produce the same output as four fuel furnaces operating under the conditions described. In order to obtain the high-grade quality of finished product from the fuel furnaces very rigid inspection must be resorted to, the rejected parts having to be reheat treated again. Properly designed electric furnaces should eliminate the rejects, consequently less materials would have to be heat treated. Practically the entire hearth area of the electric furnace is available for heat treatment due to the uniformity and constancy of temperature conditions, permitting an increased production per square foot of hearth area. Due to these conditions, the use of electric heat makes it possible to increase the production in the same floor space. However, in the case under discussion, the manufacturer was not primarily interested in increasing his production, hence this item was not allotted a value.

Decrease in Labor Cost for Hardening and Tempering

Using fuel furnaces, four skilled heat treaters, at a rate of 75 cents per hour each, would be required, at a monthly cost of $624. Using electric furnaces, four unskilled laborers can turn out the same amount of high-grade work, due to the elimination of the problems of combustion and heat treating as previously mentioned. With a labor cost of 50 cents per hour, or a total monthly cost of $416, the net savings are $208 a month.

To insure a high-grade product using fuel rigid inspection and testing are necessary. This would require three men at $100 per month, minimum, apiece.

Using electric heat, the amount of inspection and testing is greatly reduced, since it is possible to turn out a heat-treated product with practically no rejects. However, as a certain amount of testing and inspection is necessary, it is assumed that, for the sake of insurance against possible defects, one man at $100 per month is still required or charged against this item, using electric heat, which will make the saving in labor for inspecting and testing $200.

Decrease in Labor Cost After Heat Treatment

With a uniformly heat-treated product hard spots in the steel are eliminated, with the result that subsequent machinery operations are made much easier due to this more uniform grain structure. Since we have assumed that this manufacturer has the highest grade fuel equipment and heat treaters and is ultimately securing a uniform product, due to the very careful inspection and testing system employed, no increased value could be placed on this item.

The operation of a fuel furnace is somewhat like the operation of a boiler. Attention must be given to lighting the burners, keeping them clean and adjusted, regulating the combustion to see that the heating effect is as good as may be expected, and otherwise giving a certain amount of general attention to the operating conditions of the furnaces. In the case under discussion, the time required is the equivalent of one man-hour per day at 50 cents and one man-hour per day at 75 cents per hour, or a total monthly cost of $31.50.

With electric furnaces, a night watchman on his rounds in the morning, by simply pushing a button, places the furnaces in operation, so that by the time the workmen arrive the furnaces are up to operating temperature, ready for production at the beginning of the day. Even this small amount of attention may be eliminated, as a time clock may be employed for automatically starting the furnace at any predetermined time.

Better Working Conditions

Every manufacturer appreciates the extent to which his profits are affected by the labor conditions within his plant. Labor turnover, due to difficult or unsatisfactory working conditions, in comparison with employment elsewhere, causes a tremendous loss each year. In some heat-treating departments using fuel-fired furnaces the labor turnover, due to the operating conditions under which the men must work, amounts to 100 per cent per year.

With the electric furnace there is so little heat given off that the furnaces need not be placed in a separate room, but may be located anywhere in the shop. There are no hot gases or fumes coming out into the room to be breathed by the workmen, nor is there a deafening roar, such as with fuel furnaces. No ventilating fans are required, causing annoying and possibly injurious drafts. The workmen need not go half clothed in order to work around the furnaces, since the workroom can be kept at practically the same temperature as the rest of the shop, and they are able to spend full time at their work, especially during the hot summer days.

The above features, typical of the electric furnace, are actually worth a great amount to any manufacturer and a value can readily be placed on this item of better working conditions. A value of $10 a month is allowed, which is insignificantly small and altogether out of proportion to value received for the case considered.

Several industrial plants have reported that electric

heating has done more to promote better working conditions, better satisfied labor and reduced labor turnover than could have been accomplished through a 10 per cent increase in wages. With a monthly wage of $416 for those directly affected by the furnaces, this item should amount to $41.60 a month.

Ease of Operation

The automatically controlled electric furnace is an ideal piece of apparatus to operate. Pushing a button turns on the heat; the furnace comes up to the proper temperature and remains at this predetermined temperature without attention. When the day is over a push of a button cuts off the current. Nothing could be simpler or easier in its operation.

This feature has a value, unquestionably, but in this particular case the position was taken that the men are well paid to perform all the operations incident to starting, stopping and operating the furnaces, hence no allowance will be made for this item.

A fuel-fired furnace, operating at temperatures suitable for hardening purposes, will require, during a ten-year period, expenditures equal to double the cost of the brickwork and burners, at the very minimum. With a value of $3,000 for the parts of the furnace covered by the above items, the maintenance cost over a ten-year period would be $6,000, or an average of $600 a year or $50 a month. These are minimum figures, but they are capable of exact determination by any company keeping an accurate record of all expenditures on the furnaces. Therefore, for the fuel furnace a maintenance cost of $50 per month is allowed.

Manufacturing plants, generally, are beginning to appreciate the durability of construction of electric furnaces and the small expenditures required for upkeep in comparison with fuel-fired furnaces. The destructive effects due to the high combustion (flame) temperatures are eliminated. The temperatures of the hottest portion need not exceed the operating temperature of the furnace by more than 100 deg., so that the refractories, instead of operating at, say, 2,700 deg. F., will not exceed 1,600 or 1,700 deg. F. At such low temperatures refractories will last indefinitely. The heating elements constitute the only part of the furnace, within a ten-year period, that may require maintenance. One should not confuse the maintenance or operating cost of a small box type or laboratory type furnace with the production type furnaces as built today. In the small furnace one is limited as to space, materials and construction, it being necessary to crowd as great an amount of heat as possible into a small space. A production furnace is usually designed for a particular job, in which case ample space is provided for heating elements and refractory supports of generous proportions and design. A life of 25,000 to 30,000 hours at an operating temperature of 1,470 deg. F. should be expected. This would correspond to ten years' operating life. At a replacement cost of $2,400 for heating elements, the yearly maintenance should not exceed $240, or $20 per month.

Substantiated evidence from manufacturing companies which were very large users of fuel-fired furnaces and now are using electric furnaces show that the decrease in maintenance charge of the electric furnace, plus the saving in lost time due to shut-downs of fuel furnaces, more than compensates for the increased power bill versus fuel bill, and allowance was made in accordance with the difference in maintenance only, or $30 per month.

Under this heading there are two items to be considered, the rehandling of material due to having a 25 per cent rejection and the excess amount of handling of the material due to furnaces not being located in line of production, such as is possible only with electric furnaces. Each of these items is susceptible of exact determination as to the expenditure in each instance. In this case it is safe to say that the services of one man at $75 per month is saved.

With oil-burning equipment this item becomes of considerable importance when the handling charges for the oil, cost of compressed air and ventilation are all properly included. Such charges will increase the costs by $2\frac{1}{2}$ cents to $4\frac{3}{4}$ cents per gallon of oil consumed. With gas furnaces these charges are limited to the cost of installing, operating and maintaining the ventilating system, which in this case is placed at an expenditure of $5 a month.

Electric lamps and reflectors used in the vicinity of fuel-fired furnaces become blackened with carbon dust, thus greatly reducing the illumination; windows become covered with dirt and objects lying around become indistinct and are apt to become a source of accidents, due to the men falling or stumbling over them. Electric heat, being dustless, results in better illumination. A valuation of 50 cents a month per man is placed on this improved condition, which for four men amounts to $2 per month.

Table II—Evaluation of Benefits Derived from Electric Operation

	Increased Value of Electric Furnaces Over Fuel Furnaces per Month	
	Dollars	Per Cent of Fuel Costs
Improvement in quality	20.80	12.85
Dependable production	10.00	6.18
Less stock in process of manufacture	50.00	30.80
Increased production		
Decrease in labor cost for heat treating	208.00	128.50
Decrease in inspection and testing cost	200.00	123.50
Decrease in labor after heat treatment		
Useful time added entirely to manufacturing	31.50	19.50
Better working conditions	10.00	6.18
Ease of operation		
Decrease in maintenance	30.00	18.53
Minimum handling of materials	75.00	46.25
Reduced operating cost of accessory equipment	5.00	3.08
Reduction in accidents	2.00	1.23
Reduced fire and explosion hazards	5.00	3.08
General improvement in shop conditions	1.00	0.62
Total gross savings	$648.30	400.30

Table III—Net Advantages of Electric Operation Equivalent to 56 per Cent Return

Production, average number tools per month	208,000
Selling price	$208,000.00
Cost of fuel per month	$161.86
Cost of fuel per tool manufactured, mill	8/10
Cost of electric power per month	$342.20
Cost of electricity per tool manufactured, mills	1.65
Gross value of tangible advantages in the use of electric furnaces over fuel furnaces per month	$648.30
Net value of tangible advantages in the use of electric furnaces over fuel furnaces, deducting the difference between power and fuel costs per month	$466.96
Value of tangible savings per year	$5,603.52
Cost of electric furnaces, installed, ready for operation	$10,000.00
Interest returned on investment, per cent	56

Reduced Fire and Explosion Hazard

The handling of an explosive material involves a hazard. Valves and piping occasionally leak. Furnaces sometimes back-fire. These things seldom occur, but when they do, the resultant loss may be sufficient to pay for new electric furnaces and all the power they would consume over many years of operation. Production losses may amount to a highly important item.

Accidents around fuel furnaces are primarily due to thoughtlessness on the part of the operators, but oftentimes are due to defective equipment. A man in the act of lighting the burner of the furnace may have turned on the gas and at that instant have his attention distracted or be called elsewhere, and then, returning later, light the burners, with the probability of a severe explosion.

Every manufacturing plant spends a considerable sum of money annually for insurance against fires and explosions, but such insurance does not cover loss of production. The elimination of such hazards is the cheapest form of insurance and is provided by electric heat, which is evaluated in this instance at $5 a month, as insurance against the possibility of property and personal damages and loss of production.

The improvement in shop appearance at one time was given practically no attention. That condition is now confined to the plants that are the least progressive. High-grade equipment, of neat and pleasing appearance, equipment that does not get dirty or create dirt has a beneficial effect on all the workmen coming in contact with it. Such apparatus unconsciously creates a desire to keep the shop clean and is directly reflected in the amount and quality of the labor performed.

More money is being spent for white paint to brighten the walls and ceiling of the rooms than ever before. The rooms are better illuminated and the floors are kept in better condition so as to avoid accidents. All accumulation of dirt or rubbish on the floor is removed each day instead of piling up for months at a time, as frequently was the case in the past.

Electric furnaces, always being clean, neat and pleasing in appearance, are instrumental in producing a better and neater appearing shop. Walls are not blackened, as is the case where fuel-fired equipment is used. Bulbs and reflectors of electric lights do not become a reservoir for carbon deposit. It is sometimes difficult to assign a true value to this item, but unquestionably it is worth something. The higher the value a manufacturer places on general shop appearance the more important this item becomes. A value of $10 a month may be conservative with the manufacturer under discussion, but $1 per month is assigned as the value of better shop appearance, corresponding to a saving of only two hours of labor per month in washing windows and electric light bulbs and reflectors.

There may be other items affecting over-all costs, but those which have been discussed are the principal ones. The grand totals of these items (Table II) show an increased value of electric furnaces over gas furnaces of $648.30 per month. Deducting the excess cost of electricity over fuel, $181.34 (see Table I), the net saving is $466.96 a month, or $5,603.52 a year. Based on the cost of the electric furnaces suitable for the conditions considered, this net saving is equivalent to 56 per cent return on the investment.

Reliability in Water Supply

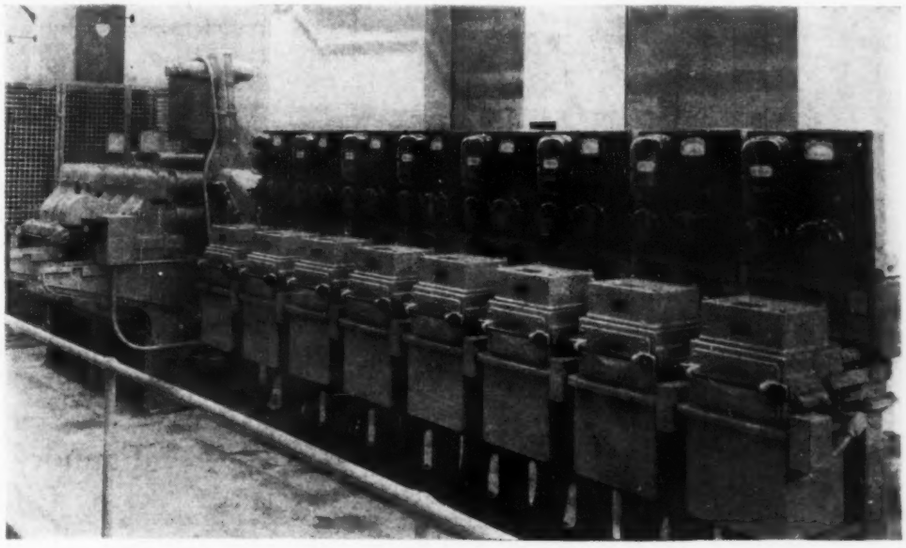
Illinois city, convinced of electric service reliability, purchases power for water pumping. Duplex design and armor-clad bus and switchgear assure against failures in operation

By C. N. Robinson

Power Engineer Public Service Company of Northern Illinois, Chicago, Ill.

A MODERN, fully electrified pumping station has taken the place of the old heavy-duty steam station of the city of Waukegan, Ill. A few years ago the old plant was superseded by electrically operated equipment in the steam plant building, but this has now given way to a specially constructed station.

The water conditions were unsavory and the lack of a filtration plant was sorely felt. The inadequacy of the old plant, as well as the desire for a more palatable water, engendered a move to secure a modern filtration and pumping plant capable of serving the city. The new plant is situated on a peninsula extending into Lake Michigan, which is an ideal location for such a project. The entire plant is designed on the duplex plan, affording reliability and flexibility of control. Should an imaginary line be drawn through the center of the plant each half would be a duplicate of the other, architecturally, mechanically and electrically.



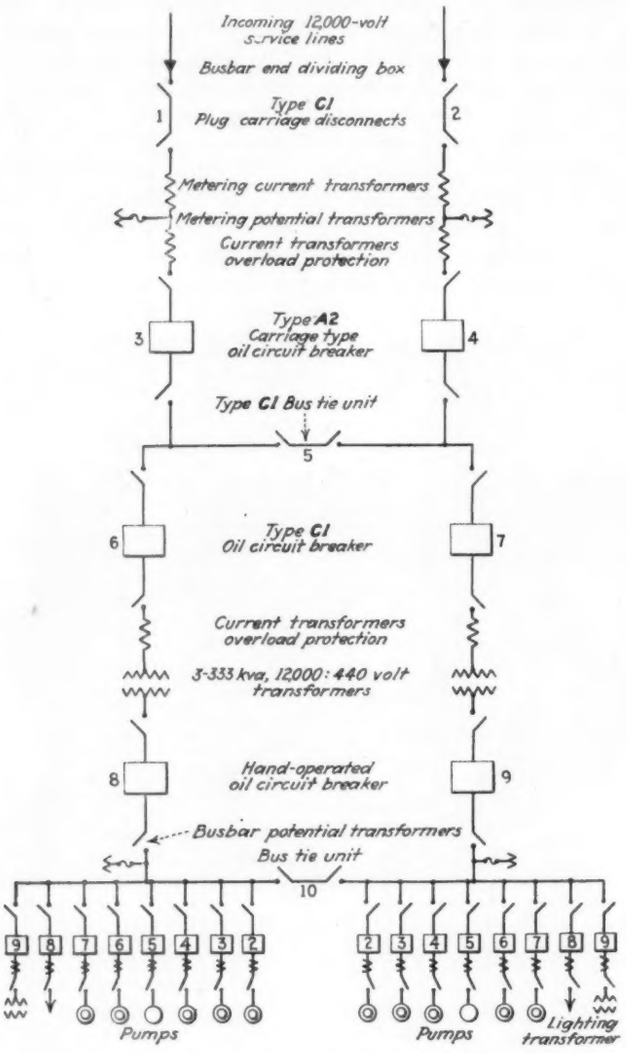
Integrating and Indicating Meters on All Secondary Circuits Permit a Continuous Detailed Check of Plant Performance

Raw water enters the plant through a 24-in. intake, extending into deep water about 3,000 ft. out in the lake. Four 5,000,000-gal.-per-day vertical, low-lift, raw water pumps, arranged in pairs, provided with cross-over piping and driven by 75-hp. motors, discharge through venturi meters into cast-iron grit chambers, which remove a majority of the solid matter and from which the water flows into primary aërator channels. On discharge from the aërator the water passes to the bottom of sedimentation basins and then into the filter beds for further purification.

Each of the ten filtration beds, five located on each side of the filter gallery, is provided with a control table, with push-button control for the operation of wash water

pumps, one for each side of the filter gallery. These pumps supply 5,400 gal. per minute and are connected to 100-hp. motors. From the filter beds the water enters the clear wells located below the filters. It is then treated with chlorine, enters secondary aërators and is discharged into the storage reservoirs.

Clear, wholesome water is now ready for pumping directly to the city's distribution mains. Four 5,000,000-gal. horizontal, 200-ft. head, high-lift pumps, propelled by 250-hp. motors, are utilized for this purpose. Each



Duplex Operating Units in the Waukegan Pumping Station Insure Uninterrupted Service Supply

major pumping unit is provided with wound-rotor motors, designed for 440-volt service, equipped with automatic inclosed starters with overload and low-voltage protection.

Electric power is supplied to the plant by means of a two-tap, 12,000-volt, 60-cycle service from tie lines connecting two important generating plants of the Public Service Company of Northern Illinois. The service cables extend through two 6-in. wrought iron pipes underneath Waukegan Harbor and thence underground to the incoming line disconnects, located in the 12,000-volt service room within the plant.

The principal feature of the electrical installation is the use of Allis-Chalmers Reyrolle, totally inclosed metal-clad switchgear for both the 12,000-volt primary service and the 440-volt distribution system. Reliability was an important factor in the selection of the switching equipment. It is believed that this installation is the first in the United States employing this type of equipment in a municipal pumping plant.

Two panels or units of type A-2 and five panels of type C-1 metal-clad switchgear, including a bus tie unit, constitute the 12-kv. main bus installation, as indicated by the diagram. The units are arranged in parallel rows along the walls of the 12-kv. service room. All busbars and fixed conductors in the units are imbedded in insulating compound. The main incoming line oil circuit breakers, designated as units No. 3 and No. 4, are rated at 300 amp., with an interrupting capacity of 500,000 kva. at 15,000 volts, and are solenoid operated. To insure continuity of service, the main oil circuit breakers are electrically interlocked and their operation is automatically selective; that is, should an interruption to service occur on one of the two incoming lines the oil circuit breaker on the second line would be automatically switched into service.

At any time the entire station pumping load can be transferred from one transformer bank to the other. The two sets of three 333-kva. transformers, transforming from 12,000 volts to 440 volts, are located in separate transformer rooms. The low-tension 440-volt switching equipment is located on the pump room floor, parallel to the inner walls of the transformer rooms, and is similar in design to the 12-kv. metal-clad gear. Secondary units Nos. 8 and 9 contain the oil circuit breaker and disconnects for feeding the 440-volt bus from the transformer banks. This breaker has a rating of 1,300 amp. at 660 volts. The sectionalizing unit designated as No. 10 is utilized in tying the 440-volt gear bus together, enabling flexible control of the 440-volt equipment. The frontispiece of this issue shows other views of this station.

Foundry Costs Reduced by Lifting Magnets

LIFTING magnets may be advantageously used in gray iron foundries for many material-handling jobs. Some of the direct possibilities were pointed out by Albert Walton, consulting engineer, of Philadelphia, at the recent convention of the American Foundrymen's Association. As mentioned by Mr. Walton, magnets may be used for unloading pig iron and scrap from railroad cars, for stocking this material in the yard and for handling it to cupola charging boxes and buckets. In direct cupola charging, if the operation is continuous for a number of hours, it is advisable to use two magnets alternately, since one will heat up considerably in continuous use. The change, however, does not have to be made oftener than every one and one-half to two hours. Magnets may be used for the handling of iron slabs on the molding floor and also for lifting iron or steel copes, picking up and transferring castings to the cleaning room or to suitable trucks and for going over molding floors after the castings are removed and picking up gates, risers, nails and other pieces of iron and steel. By the use of magnets on the work described a reduction in labor cost can be made down to one-tenth of what it would be without mechanical appliances. A single magnet installation will replace ten or twelve men on this class of work and it will do the work more effectively and quicker.

Effect of Rate Changes

Graphical presentation by charts gives revenue effects of rate changes. Construction and use of charts for rate forms. Accuracy good and time saved

By C. F. DE MEY

Central Hudson Gas & Electric Corporation, Poughkeepsie, N. Y.

THE problem of estimating the effect of new or proposed rates on revenue may be divided into two parts, the general effect of the proposed rates on revenue expected from a group or class of customers and the effect on the individuals of each group. Generally, if the individuals are small and submerged within the group no calculations are made of separate accounts, the revenue predictions being made for the group or class as a whole. On the other hand, if the group is not large or contains unusual or important customers the effect of proposed rates on these accounts is usually necessary before a decision can be reached.

Calculation of results on individual accounts can be conveniently done in a number of different ways. It is important in selecting the method to balance the value of results with the time and cost of the analysis. Generally, the actual calculation of each monthly bill or the usual short-cut method of computing customers' bills *en bloc* for the period considered can be followed. Where the number of customers is large these methods become slow and expensive, to say nothing of the many chances for error if the rates are only slightly complicated.

In searching for a method readily applicable to a large number of accounts with a minimum chance for error a graphical solution of the problem has been developed. This is not presented as a universal substitute for all methods employed heretofore, but where the number of accounts is in excess of 100 or 150 and the rates are not of the simple straight line or block type it is believed that results of sufficient accuracy will be obtained in much shorter time than by other methods.

Use of Differential Chart

Like many processes, the success of which depends on one particular detail, the present method of computation has been developed around a special type of rate chart. For want of a better name, it has been called a "differential chart," mainly because it represents the differences between two others of the general type outlined in Fig. 1. Here we see demand and energy as abscissas and ordinates respectively, with monthly bills indicated at their intersections. The plotting of this chart is, very briefly, as follows:

For each demand and energy block of the rate develop expressions for monthly bill in terms of an energy charge, a demand charge and a constant or customer charge; that is,

$$\text{Monthly bill} = aE + bD + c$$

Some rates may not contain all of these factors; for example, a straight line rate will have the characteristic equation

$$\text{Monthly bill} = aE$$

where a is the rate per kilowatt-hour and E the monthly consumption measured in kilowatt-hours.

If a block rate is involved the first block will be the same as a straight line rate. Subsequent blocks will have a constant added and will take the form:

$$\text{Monthly bill} = aE + c$$

where a is the rate per kilowatt-hour of the block and c is a constant amount determined from the factors of the preceding blocks.

Chart construction is greatly simplified by locating a few important points and then completing the revenue division to the desired detail by interpolation. Since in any block of the rate all revenue contours are parallel and equally spaced for equal revenue differentials, this process is not difficult.

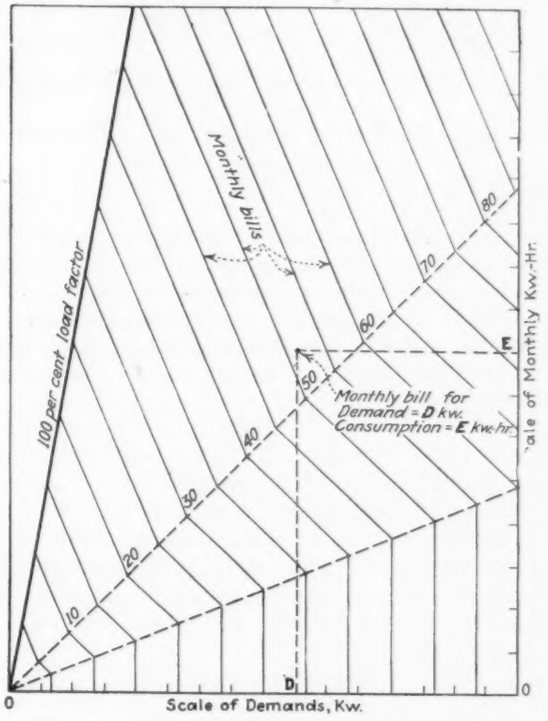


Fig. 1—General Type of Rate Chart

Suppose we plot two such charts on the same sheet, one of the present rate and the other of the proposed rate. This has been done in Fig. 2. It is readily seen that a third chart can be obtained indicating intersections of revenue contours of the first and second. For example, a contour of the third chart will be the locus of all values where the present and proposed rates give equivalent revenue. Similarly, other contours will indicate the loci of points where the proposed rate is higher or lower than the present. This third chart has been

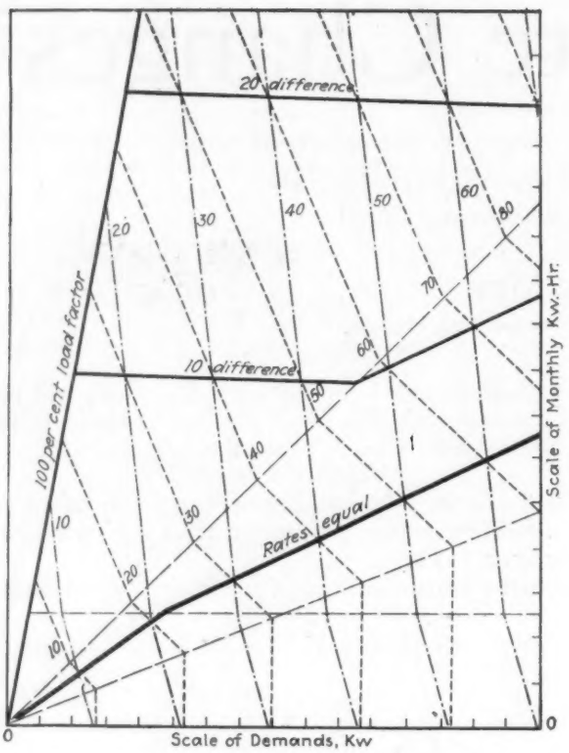


Fig. 2—Rate Chart Showing Present and Proposed Rate

referred to above as a "differential chart" and its development and use will now be described.

In actual practice it is usually more accurate and faster to construct the differential chart directly from equations of the rates involved rather than by the graphical method described above. Let us assume the present rate is as follows:

	Cents per Kw.-Hr.
First 1,000 kw.-hr. per month	8
Next 1,000 kw.-hr. per month	6
Next 1,000 kw.-hr. per month	4
Over 3,000 kw.-hr. per month	2

Minimum monthly bill, $2 per kilowatt of maximum demand.

It is proposed to substitute for this rate one having greater inducements for load factor improvement as follows:

Demand Charge:
$2 per kilowatt maximum demand per month.

Energy Charge:	Cent per Kw.-Hr.
First 1,500 kw.-hr. per month	6
Next 1,500 kw.-hr. per month	3
Over 3,000 kw.-hr. per month	1½

It is at once apparent that the proposed rate is higher at low load factors and lower at high load factors than the present. These rates, of course, have been set up as illustrative of the method and are not taken from actual experience.

The first step in laying out our chart is to develop expressions for the monthly bill under each rate in terms of demand and energy and for each consumption block. An investigation of the present rate results in the following equations:

Monthly Consumption Block	Equation for Monthly Bill
0-25 kw.-hr. per kilowatt	$2 \times$ kw.
25 kw.-hr. per kw.-1,000 kw.-hr.	$0.08 \times$ kw.-hr.
1,000 kw.-hr.-2,000 kw.-hr.	$20 + 0.06 \times$ kw.-hr.
2,000 kw.-hr.-3,000 kw.-hr.	$60 + 0.04 \times$ kw.-hr.
Over 3,000 kw.-hr.	$120 + 0.02 \times$ kw.-hr.

For the proposed rate we have:

0-1,500 kw.-hr.	2 kw. $+ 0.06 \times$ kw.-hr.
1,500 kw.-hr.-3,000 kw.-hr.	$45 + 2 \times$ kw. $+ 0.03 \times$ kw.-hr.
Over 3,000 kw.-hr.	$90 + 2 \times$ kw. $+ 0.015 \times$ kw.-hr.

The simultaneous solution of pairs of equations properly chosen from each rate will give the equations of contours desired on the differential chart. In obtaining solutions, care should be observed to choose equations which are common to consumption blocks of each rate, otherwise the solutions would, for all practical purposes, be imaginary. In the present example common consumption blocks are as follows:

Present Rate	Proposed Rate
0-25 kw.-hr. per kilowatt 25 kw.-hr. per kilowatt-1,000 kw.-hr. 1,000 kw.-hr.-2,000 kw.-hr.	0-1,500 kw.-hr.
1,000 kw.-hr.-2,000 kw.-hr. 2,000 kw.-hr.-3,000 kw.-hr.	1,500 kw.-hr.-3,000 kw.-hr.
Over 3,000 kw.-hr.	Over 3,000 kw.-hr.

A few sample solutions will now be given:

1,000 kw.-hr.-1,500 kw.-hr.

$$20 + 0.06 \times \text{kw.-hr.} - 2 \times \text{kw.} - 0.06 \times \text{kw.-hr.} = 0$$
$$\text{kw.} = 10$$

2,000 kw.-hr.-3,000 kw.-hr.

$$60 + 0.04 \times \text{kw.-hr.} - 45 - 2 \times \text{kw.} - 0.03 \times \text{kw.-hr.} = 0$$
$$\text{kw.-hr.} = 66.667 \times \text{kw.} + 833.333$$

Over 3,000 kw.-hr.

$$120 + 0.02 \times \text{kw.-hr.} - 90 - 2 \times \text{kw.} - 0.015 \times \text{kw.-hr.} = 0$$
$$\text{kw.-hr.} = 400 \times \text{kw.} - 6{,}000$$

The above solutions give expressions for the equality line or contour as it traverses each consumption block. If other contours are desired, such as where the proposed rate is $10 lower than the present, the following slight modification of the solutions is made:

Over 3,000 kw.-hr.

$$120 + 0.02 \times \text{kw.-hr.} - 90 - 2 \times \text{kw.} - 0.015 \times \text{kw.-hr.} = 10$$
$$\text{kw.-hr.} = 400 \times \text{kw.} - 4{,}000$$

Table I—Monthly Consumption and Billing of Sample Customers

Customer	A	B	C	D	E	F
Maximum Demand Kilowatts	4	7	10	13	15	20
January	1,040	230	1,220	250	2,500	1,800
February	1,020	420	1,280	280	2,780	1,950
March	870	160	1,190	240	3,300	1,760
April	920	70	1,350	780	3,260	1,680
May	690	130	1,760	810	3,180	1,820
June	720	240	1,690	1,250	3,550	1,640
July	760	360	1,710	1,480	3,320	1,420
August	650	760	1,680	2,180	3,570	1,030
September	810	650	1,810	1,860	3,980	1,180
October	950	430	1,780	1,260	3,280	1,960
November	1,120	590	1,650	160	3,510	2,120
December	960	480	1,590	250	2,840	1,950
Total	10,510	4,520	18,710	10,800	39,070	20,310
Actual billing old rate	837.20	374.80	1,362.60	835.40	2,203.80	1,456.20

Table II—Application of Differential Chart to Sample Customers

	Differences					
Customer	A	B	C	D	E	F
January	—12.00	+8.80	0	+15.00	—10.00	+11.00
February	—12.00	+4.80	0	+16.00	—12.90	+6.50
March	—9.50	+10.00	0	+14.50	—16.40	+12.00
April	—10.10	+6.80	0	+10.20	—16.10	+14.60
May	—5.90	+8.70	—7.90	+9.90	—15.90	+10.50
June	—6.20	+8.60	—5.80	+6.00	—17.60	+16.00
July	—7.40	+6.30	—6.10	+6.00	—16.50	+20.00
August	—5.00	—1.40	—5.70	—10.50	—17.80	+20.00
September	—8.10	+0.50	—9.30	—4.60	—20.00	+20.00
October	—11.00	+4.90	—8.20	+6.00	—16.20	+6.10
November	—12.00	+2.00	—4.60	+10.00	—17.60	+3.90
December	—11.20	+4.10	—2.50	+15.00	—13.30	+6.50
Totals	—110.40	+64.10	—50.10	+93.50	—190.30	+147.10

(+) Indicates increase, (—) decrease, of proposed rate over old rate.

If the locus of points where the proposed rate is $10 higher than the present is desired, substitute —10 for 10 in the above and solve for kilowatt-hours in the usual manner. Other equations are handled in the same manner.

It is by no means necessary to obtain equations for every line of the chart; usually, the equality line and a few above and below it are all that are required. The remaining divisions can be obtained by interpolation as previously described for chart in Fig. 1.

Having developed a number of equations for values of the differential chart, solutions by the usual substitution method are obtained and the points are plotted. When these are intersected by straight lines in each block the completed chart is obtained as illustrated in Fig. 3.

Application of Chart

We will now proceed with the application of the chart to a sample group of customers. Table I represents the performance of six small power customers during a twelve-month period and also gives their actual billing under the present rate. Applying the chart to these accounts results in the monthly increases and decreases caused by the proposed rate as indicated in Table II.

The value of knowing the individual differences is at once apparent. Although the proposed rate decreases the group as a whole something less than $50, we find individual differences as high as $190.30 decrease for customer "E" and $147.10 increase for customer "F."

In order to demonstrate the accuracy of values given in Table II, billing under the proposed rate has been computed, and in Table III a comparison of actual differences with those shown in Table II is given. It is interesting to note that a maximum error of 0.46 per cent is indicated. While on the subject of accuracy, it may be well to point out an interesting feature of the differential chart. It is a well-known fact that the accuracy of any chart depends largely on the scale to which it is drawn. One of the type illustrated in Fig. 1, 8 in x 10 in., may be read to within 0.2 per cent of the true values. This is sufficiently accurate for all practical purposes. However, if the difference between two such readings is desired, the error in the difference may well become as high as 100 per cent or even greater, since the difference may be only a small fraction of the whole. In general, the smaller the difference the larger will be the chances and percentage of error.

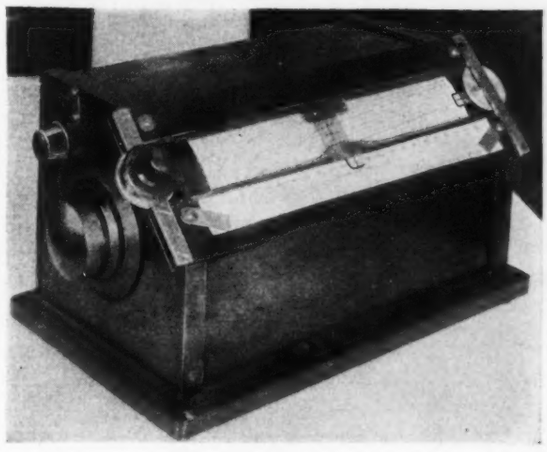


Fig. 4—Chart Reading Machine Developed to Facilitate Readings

Our differential chart overcomes this difficulty in the following manner: Suppose we develop a differential chart of two rates in which the maximum difference of $10 exists within the boundaries of an 8-in. x 10-in. sheet. This may actually be the difference between monthly bills many times this value, yet we are measuring it to the same percentage accuracy as would be possible with the bills themselves. Since few rate changes involve very large differentials, an unusually high accuracy can be maintained.

It was early recognized that the accuracy of results and consequently the value of any graphical method of computation depend very much on the ease with which readings are taken. In order to facilitate this phase of the work and reduce observational errors to a minimum a chart-reading device was designed and constructed as illustrated in Fig. 4. This machine is essentially a smooth cylinder equipped with clips for holding the chart and mounted on bearings, installed in a suitable housing. The large "radio dial" on the left is mounted on the cylinder shaft and provides means for rotation. The small control knob on the sloping section controls the movements of the cursor which is shown midway along its guides.

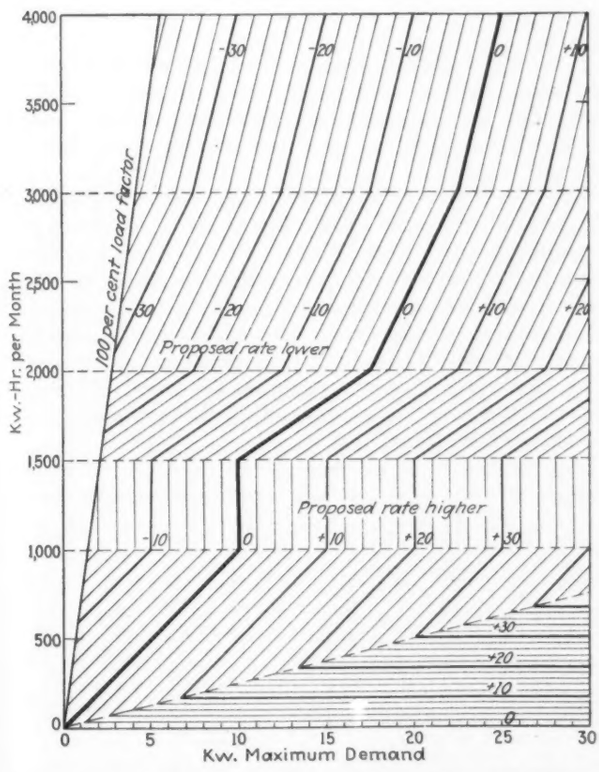


Fig. 3—Differential Rate Chart Proposed for Determining Effect of Rate Changes

Table III—Comparison of Results from Chart with Actual Calculations

Customer	A	B	C	D	E	F
Actual billing old rate	837.20	374.80	1,362.60	835.40	2,203.80	1,456.20
Actual billing proposed rate	726.60	439.20	1,312.50	928.80	2,012.80	1,603.20
Actual differences	—110.60	+64.40	—50.10	+93.40	—191.00	+147.00
Chart differences	—110.40	+64.10	—50.10	+93.50	—190.30	+147.10
Per cent error	0.18	0.46	0.00	0.12	0.37	0.07

An index at the right and cross-bar lines on the cursor provide the abscissa and ordinate measurements that are required.

Assuming that a chart similar to Fig. 3 is to be used, it is clamped on the cylinder, care being taken that it is accurately aligned. Rotation of the cylinder brings the desired kilowatt-hour value under the right-hand index and movement of the cursor to the desired kilowatt demand value. The chart is then read at the intersection of the cross-hair lines on the cursor. In comparison with the usual methods, this device speeded up reading about fourfold and greatly increased the accuracy of the results obtained.

Before concluding, it may be well to outline other uses for rate charts plotted on the demand-energy co-ordinates. The chart illustrated in Fig. 1 may be used for checking bills or for auditing where absolute accuracy is not necessary. It may also prove useful to power engineers and other commercial representatives for quickly estimating revenues from prospective customers. The differential chart may prove helpful in the presence of optional rates to determine the rate that is proper for a prospective customer.

For a more complete analysis of the charts similar to Fig. 1, described in this article, the reader is referred to "Central-Station Rates in Theory and Practice," by H. E. Eisenmenger. Valuable suggestions are also incorporated in an article by the same author appearing in the June 2, 1923, issue of the ELECTRICAL WORLD.

House Heating Encouraged by Low Rates

A SPECIAL rate intended for house heating installations where electricity is the principal source of heat for the home has been instituted by the Indiana Service Corporation of Fort Wayne, Ind. An installation of electric house heating in this territory was described in a recent issue of ELECTRICAL WORLD.* Features of this special rate are as follows:

1. The rate is available to a limited number of customers up to the point where the total night load on the company's system is equivalent to 75 per cent of the maximum daytime load. Heating energy may be used through the same meter and under the same limitations as to time as domestic hot water heating.

2. Available for strictly off-peak use, both as to station capacity and transmission and distribution line capacity. Right reserved to refuse service where existing idle plant and distribution line capacity limit availability.

3. Based upon the use of an underground service installed at the expense of the customer. Where overhead service is required, right is reserved to charge for additional cost of larger service.

4. Energy charges shall be:
   2 cents per kilowatt-hour for the first 400 kw.-hr. per month.
   1 cent per kilowatt-hour for all energy in excess of 400 kw.-hr. per month.
   Minimum charge $4 per month for twelve months of each year.

5. Rate is designed for a demand up to 50 kw. For larger demands a service charge of 10 cents per kilowatt per month in excess of 50.

6. Customer is required to install on the circuit controlling electrical heating elements an approved time clock which the company reserves the right to set so as to limit the use of electricity on the circuit to hours specified.

7. Variation of more than 15 per cent above or below $3.40 per net ton for coal delivered to company's bunkers shall involve an increase or decrease of 8½/100ths of a mill per kilowatt-hour in the energy rate for each $0.05 increase or decrease in the price of coal beyond this 15 per cent variation.

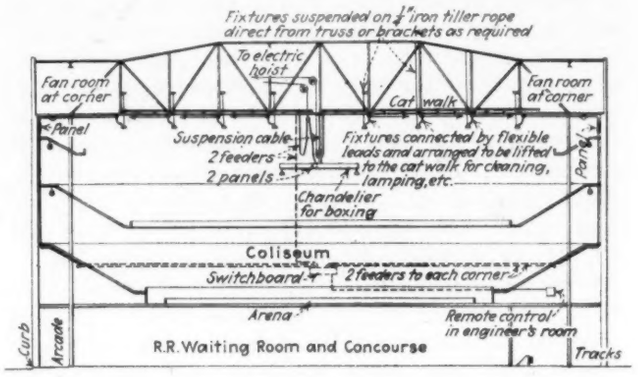
*"*A Customer's Experience with Electric House Heating*," page 449, March 2, 1929.

26 Ft.-Candles Used in Lighting Boston's New Coliseum

High intensity of illumination but one feature of lighting of sports arena. Maintenance simplified and voltage drop minimized

BY J. C. RUNYON

THE Boston Coliseum, a new sports arena 240 ft. long by 110 ft. wide, with semi-circular ends, and a total area of 23,800 sq.ft., illustrates the value of intensive illumination in indoor athletic events and may fairly be considered the most striking development of its kind thus far achieved. The consensus of opinion among lighting specialists interested in the building of this property was that the previous range of intensities was


Fixtures suspended on ½" iron tiller rope direct from truss or brackets as required
To electric hoist
Fan room at corner
Cat walk
Fan room at corner
Panel
Suspension cable 2 feeders 2 panels
Fixtures connected by flexible leads and arranged to be lifted to the cat walk for cleaning, lamping, etc.
Panel
Chandelier for boxing
Coliseum
Switchboard
2 feeders to each corner
Arena
Remote control in engineer's room
Curb
Arcade
R.R. Waiting Room and Concourse
Tracks

Cross-Section of Boston Coliseum Showing General Arrangement of Lighting Units and Circuits

far too low for the visual comfort of both players and spectators, and that for hockey in particular at least 25 ft.-candles should be available, with allowances for future increases in intensity to cope with steadily rising lighting standards.

The playing or ice area is illuminated by "Holophane" No. 691-AL units, 48 effective units being installed at a mounting height of 62 ft. above the ice surface. These units are of new design, concentrating prismatic glass with special focusing arrangement for adapting any one of several large lamp sizes. The equipment is suspended on approximate 22-ft. by 20 ft. spacings by means of iron tiller rope. Each is equipped with one 1,000-watt lamp and the average resultant horizontal foot-candle intensity on the ice is 26.4.

The method of suspending fixtures on iron tiller rope (which is very flexible) and making connections with

Length (semi-circular ends), ft.	240
Width, ft.	110
Area, sq.ft.	23,800
Mounting height, ft.	62
Spacing, ft.	22x20
Number of effective units	48
Lamp wattage	1,000
Rated voltage	115
Operating voltage	115
Unit	Holophane No. 691-AL
Average intensity, ft.-candles	26.4
Area per unit, sq.ft.	496
Watts per square feet	2
Effective lumens per unit	13,000
Generated lumens per unit	21,000
Coefficient of utilization, per cent	62
Utilization of light, lumens per watt	13

Night View of Boston Coliseum, Foot-Candle Intensity 26.4, and Snapshot by Boston "Post" of Canadiens vs. Boston Bruin Hockey Game Taken by Artificial Light

flexible cables from boxes on the lower part of the trusses permits the fixtures to be lifted to the "catwalks" for adjusting, cleaning and lamping. The walks were so designed that only a very few of the fixtures in remote positions required disconnect hangers and winches.

The wiring is from eight panels remote controlled from the engineer's office. Two of these panels are placed in each corner as near as possible to the lights they control. This arrangement did away with long branch circuits. In addition, the wiring was designed for 1,500 watts per unit to anticipate possible future demands for higher intensities. These features obtained a very low voltage loss. The voltage at the transformers tested 116 and at the lamp circuit 115, with all lamps on. As the branch circuits are No. 12 and No. 10 in some cases the drop in these circuits of short length is negligible.

The division of each of the four corners into two sections was for the purposes of economy in cleaning and other work. The arrangement is that the two outer rows of units of each quarter section are on one panel and all other units in each quarter section are on the other panel in the respective section. These latter are over the arena proper. The two outer rows in each section permit a good light for cleaning each section, without the high intensity, by simply operating push buttons on the indicating control panel in the engineer's office. In this way cleaning light may be rotated from section to section as the cleaners progress.

Another feature of flexibility, which incidentally proved an economy, is the method of feeding the boxing ring chandelier.* Instead of the customary many circuits cabled from the truss to the chandelier, the feeders were made flexible and carried to panels mounted on the chandelier. This eliminated the great bulk of wires usually found in such places, with the consequent possibility of trouble in the massive cable. The chandelier is also remote controlled from the engineer's office. The accompanying table summarizes the installation.

The Coliseum, which is a part of the new North Station of the Boston & Maine Railroad, was built by Dwight P. Robinson & Company, Inc.

**The ring is illuminated by No. 910 Leviathan X-ray reflectors, supplied by Curtis Lighting, Inc.*

Publicity Saved the Day, Says E. A. Barrows*

"WHAT we have done is to explain the basic facts of our industry. We have told how electricity is generated, how distributed. How our rates are arrived at and how regulated, how we are financed, and other fundamental facts about our business. Are the public utilities alone to be deprived of the right of free speech? . . . I am convinced that if it had not been for the work of the Public Relations Section of the N.E.L.A. during the past few years the effect of the Federal Trade Commission's investigation upon the public mind would have been far more serious than it is today."

**Vice-President Narragansett Electric Company, Providence, R. I.*

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

The Modern Use of Pulverized Fuel in Power Stations.—R. A. CHATTOCK.—As a result of the experimental work carried out in the Birmingham electric power station it has been demonstrated that the use of pulverized fuel gives a higher combustion heat efficiency in the boilers than is obtained with mechanical stokers. Boilers having a capacity far greater than those equipped in the past with mechanical stokers can be used with a consequent reduction in the capital cost of boilers and boiler house; that is, a set-off against the higher capital cost of the pulverized fuel equipment compared with mechanical stokers. The evolution of pulverized fuel distillation is tending toward reducing equipment and greater simplicity in operation; this is effected by eliminating the coal driers and the conveying and storage of the pulverized fuel.—*Report of the Institution of Electrical Engineers*, April 18, 1929.

The London Power Company.—The advantages of the Deptford site for the supply of power to London, recognized over forty years ago by Ferranti, decided the London Power Company, in addition to enlarging the existing Deptford station, to build the first of its new stations immediately alongside it. This station is known as Deptford West. It has been planned to contain six main generating units of an aggregate capacity of 195,000 kw. maximum continuous rating. Four sets are now being installed, two rated at 27,500 kw. and two at 35,000 kw. each. The future pair of machines will probably be rated equally at 35,000 kw., thus bringing up the whole capacity of the plant to the figure mentioned.—*Engineer (England)*, April 5, 1929.

Generation, Control, Switching and Protection

Relay Protection at Toronto-Leaside 220-Kv. Transformer Station.—The protective relay installation at this station is only a part of the protective equipment on the whole transmission system, and in order to get a thorough grasp of the situation an outline of existing conditions is presented. In the design of this relaying the following requirements were kept in mind: The protection at the various stations must be so co-ordinated that all parts will function in their proper relation to the entire system. It must be suitable to the operating requirements of the system and to the diagram of connections, and, conversely, the present possibilities of effective relaying should be one consideration in deciding upon the diagram. The purpose of the protective relaying is to promote continuity of service throughout the system by detaching therefrom any equipment or circuit which is creating a disturbance to the delivery of power due to its faulty condition.—*Electrical News (Canada)*, April 1, 1929.

Interrupting Equipment for Alternating-Current High Power Circuits.—L. B. CHUBBUCK.—Until its supremacy was recently challenged in the lower voltage field by the "Deion" circuit breaker, the oil circuit breaker has, for nearly 30 years, been the chief method used for interrupting alternating-current circuits. Extended laboratory and field short-circuit tests have been made on the "Deion" circuit breakers, both under small and heavy current and at voltages up to 15,000. At Chicago successful tests were made up to approximately 25,000 amp. at 12,000 volts. It is not, however, intended to place the "Deion" breaker on the market for several months, or until operating experience can be obtained from a number of these breakers in service.—*Electrical News (Canada)*, April 1, 1929.

Transmission, Substations and Distribution

Improved Practice in Primary Cutouts.—A. K. TAIT.—The past few years have seen many important advances in design of equipment and improved practice on transmission and distribution systems, so much so that perhaps the fact of improved fuse protection on distribution transformers is of minor consequence. It is, nevertheless, worthy of note, as indicated by the increased attention which distribution engineers are giving the subject. It is a fact that the past year or so has witnessed a sweeping change in practice in regard to primary cutouts on transformers ranging from 10 to 100 kva. There are two apparent reasons for the change: The first is the tendency toward higher primary voltages, creating a demand for a better cutout, and the second is the timely introduction by the manufacturers of a satisfactory article to meet this demand.—*Electrical News (Canada)*, April 15, 1929.

Thermal Transference in Transformer Oils.—The question of thermal transference in transformer oil was brought forward in 1915 and further elaborated in a report of the I.E.E. research committee. The cooling power of three transformer oils has been investigated by means of a special apparatus, representing transformer conditions in a simplified form for experimental work. Attention has been given both to the temperature rise of the oil and to that of the windings. It has been found that classification of oils according to temperature rise of the fluid does not necessarily yield to the same order of merit as classification according to temperature reached by the windings. The physical properties of the oils have been measured and an attempt has been made to correlate cooling data with these. It appears that the group of variables is important in both cases. The temperature rise of the windings differs from that of the fluid in that it is influenced by the thermal conductivity of the oil. Further, the influence of the thermal conductivity in this case is probably greater than the influence of the group of properties represented by ac/v, in which a is the coefficient of expansion of the oil, c its specific heat per unit volume and v its kinematical viscosity.—*Journal of the Institution of Electrical Engineers (England)*, April, 1929.

Units, Measurements and Instruments

The Measurement of Pulsating Currents.—W. NELSON GOODWIN, JR.—The definition of alternating, pulsating and direct current, the characteristics of each form and the method of measuring pulsating current are described. The method and instruments necessary to employ in any particular case depend upon the purpose for which the current is to be used. The fundamental definition of current strength is based upon the electromagnetic force exerted upon a conductor carrying the current by a unit magnetic field under specific conditions. It follows from this that it is only to a direct current or to the instantaneous value of a varying current that a value in amperes or other units can be assigned, which will be the same under all conditions. There are three general classes of instruments which can be used for the measurement of pulsating current, subdivided for purposes according to whether their indications are proportional to the first or second power of the current or otherwise, namely, the permanent magnet movable coil type, the movable iron type, the electrodynamometer type, the thermal type and the polarized vane type.—*Instruments*, April, 1929.

Precautions in the Use of Standard Instruments.—W. H. LAWES.—A brief summarization of the main precautions which should be adopted in the purchase, installation and use of electrical instruments which in a test department serve for the calibrating instruments of a lower order of accuracy. The errors to which the potentiometer, dynamometer wattmeter, electrostatic voltmeter and moving-coil indicator are liable are considered and means for eliminating or reducing such errors are pointed out. The advantage of the method of discovering how errors may be produced is emphasized, with the object of securing control of such errors. The conclusion is reached that although preliminary investigations may be somewhat tedious, the result of due

precautionary measures is increased all-round efficiency. — *Journal of the Institution of Electrical Engineers (England)*, April 1929.

Illumination

The Illumination of a Large Office Building. — W. FOULKS and C. M. BUNN. — A discussion of the problems presented in the illumination of the offices in a large office building. The illumination requirements and the solution as found in the Insurance Exchange Building, Chicago. Briefly, the problem of illuminating offices is to provide sufficient illumination free from glare and annoying shadows. Since nearly all work is done in the horizontal or slightly oblique planes, the horizontal illumination is of primary importance. The illumination should be uniform over the working area of the room so that the office equipment and furniture may be located without regard to the lighting system. These conditions will be fulfilled if the ceiling is used as the secondary lighting source. — *Transactions of the Illuminating Engineering Society*, April, 1929.

Artificial Light as an Aid to Surgery. —HENRY L. LOGAN.—An attempt to determine the best visual conditions for surgical operations, outlining the requirements of a lighting system that satisfies the criteria established by the study and giving data on the system actually developed to meet these requirements now commercially available. —*Transactions of the Illuminating Engineering Society*, April, 1929.

Electrophysics, Electrochemistry and Batteries

Some Magnetic Properties of Monel Metal.—DAVID R. INGLIS. — The very extensive use of monel metal in the industries within the past thirty-five years emphasizes the need for a study of many of its physical properties. An investigation of the magnetostrictive effects in monel metal showed some very interesting results. For example, a rod of the metal, when subjected to a magnetic field, changes its length. What is still more striking about the magnetostrictive effect is the after effect. If the magnetic field is held constant at a strength of, say, 1,000 gausses, the rod begins to shorten and continues to do so for several minutes. Residual magnetism is a more certain criterion of the existence of ferromagnetism. Measurements of it were made.—*Instruments*, April, 1929.

Untreated Fabrics for Electrical Purposes.—A. R. DUNTON and A. W. MUIR. —While fabrics and tapes are of considerable importance in insulating processes the amount of these materials required for such work is so small compared with the quantities required for other purposes that up to the present time few, if any, mills have specialized in the manufacture of materials suitable primarily for electrical purposes. During the cotton boom it was practically impossible to arouse any interest in its application among the producers of woven goods. More recently there has appeared a greater willingness to try to meet the special needs of the electrical industry and it is well that these needs should be reviewed and that the characteristics of the materials which are available and those which are desirable should be appreciated.—*Electrician (England)*, April 12, 1929.

Heat Applications and Material Handling

Electric Heat: An Economic Paradox?—B. S. HAVENS.—The tremendous rate of increase in the use of electric heat in industry during the last few years has stimulated an interest in a subject which, upon investigation, discloses a number of curious facts. Those who are unfamilar with the details, but who are nevertheless acquainted with the cycle through which the electric energy passes, are likely to think they see in the use of electricity for this purpose an economic waste. Were the cost per heat unit the only factor to be considered, electric heat would, without question, be an economic paradox, to be discarded by a modern business man as quickly as he would discard a suggestion to use perpetual motion in his manufacturing processes. Yet electric heat is frequently found to be cheaper, from a standpoint of over-all cost, than any other class of energy.—*N.E.L.A. Bulletin*, March, 1929.

Recent Developments in Electric Furnaces.—D. F. CAMPBELL.—The appreciation of the advantages of electric methods of metal melting and heat treatment has made rapid progress during the last two years and it is proposed to make a rapid survey of the present processes to which electric furnaces have been applied in this country and abroad, with special reference to the non-ferrous trades, and to indicate the characteristics of the equipment used and the reasons which have influenced the adoption of electric heating. In Great Britain there are many cases where the cost of power can be substantially reduced if proper steps be taken to improve the load and power factors so as to get the best possible terms under a contract, but as the power contracts vary so much in different districts, it is advisable for manufacturers to consult men who have special experience in these intricate questions. For example, in one work, a contract is based on a fixed charge on the maximum demand measured over one-half hour and charged on a twelve-month basis. In addition, for every kilowatt-hour there is a fixed charge for the daylight hours and a reduced charge during night hours, each being subject to a sliding scale, dependent on the price of a certain quality of coal. This is a common form of contract, but gives opportunities to experienced engineers to utilize their power to best advantage and obtain the cheapest rate.—*Engineering (England)*, April 5, 1929.

Telegraphy, Telephony, Radio and Signals

The Continuously Loaded Submarine Telegraph Cable.—A. E. FOSTER, P. G. LEDGER and A. ROSEN.—It was shown that in the non-loaded cable distortion and attenuation of signals may be reduced and speed of signaling thereby raised by increasing the section of the conductor, but a limit to this procedure is at length reached by consideration of economy and facilities for manipulation. The discovery of the alloys which exhibit high values of permeability on the application of low magnetizing forces is referred to, as is also the fact that this discovery made possible the loading of telegraph cables, with consequent great increase in speed of signaling. A description is given of the method of application of the loading material to the conductor during manufacture and the subsequent process for annealing and testing. Finally, the theory of transmission of impulses through loaded cables is briefly discussed and some details are given in regard to methods of testing during manufacture and after laying.—*Journal of the Institution of Electrical Engineers (England)*, April, 1929.

Miscellaneous

Electrical Circuit Theory Based on the Method of Complex Numbers.—G. WINDRED.—An interesting fact, which will probably appeal to students of both mathematics and electricity, is that the existence of complex numbers has been known for nearly four hundred years, and it was only toward the close of the last century that the conception came to be applied to electrical theory. During the intervening period only a comparatively few contributions to the subject have been made, mostly from the purely mathematical viewpoint. The paper sets forth in its historical order of development the theory of that part of pure mathematics dealing with the conception of two dimensional numbers, which theory has proved of great assistance to the pure mathematician in connection with the theory of equations, and a source of considerable difficulty and misunderstanding in its application to certain sciences. An attempt is also made to demonstrate the possibilities of the method as a means of simplifying the mathematics of the alternating-current circuit.—*Electrician*, April 5, 1929.

Co-operation in Selling.—Co-operation and co-ordination are words which one often hears and reads today. An example of business-like co-operation between a local supply authority and local electrical contractors is afforded at Leicester. Here the corporation owns and maintains showrooms in which electrical goods are sold, but these goods have been purchased outright by a syndicate of electrical contractors who pay a fixed amount toward the cost of the showrooms, their supervision and administration. — *Electricity (England)*, April 11, 1929.

Book Reviews

Engineering English

By John H. Scott. New York: John Wiley and Sons, Inc. 321 pages, illustrated. Price, $2.75.

This is a text for engineering colleges and has several unusual features. It applies English to engineering topics; it accents word usage, phrasing, composition and other normal elements and it deals with the preliminary studies and preparations needed to complete an engineering manuscript.

Good English is not peculiar to engineering, but there are certain rules, methods and subject treatments peculiar to engineering wherein good English can be made tangible to engineering students. Specification writing, the investigative paper, the apparatus paper, the process paper, the invention paper all lend themselves to a treatment that will give the reader and the writer certain basic information. The use of abbreviations and of capitals and italics in engineering writing are subject to certain rules well treated by Professor Scott.

The book is well done and deserves commendation. The author recognizes that style or the gift of expression is not a matter of rule and contributes only those ideas of form and analysis that enable a writer to produce a good engineering composition. A slight criticism might be made in the treatment of papers in that the "introduction" is still held an essential part of the composition. Engineers in the field are coming to realize more and more that the executive, the reader and the editor care little for the introduction.

Bauelemente der Feinmechanic

By O. Richter und Dipl.-Ing. R. von Voss. Berlin: VDI-Verlag, G.m.b.H. 576 pages, 1,852 illustrations, 36 tables.

The quantity production of small parts and light mechanism has involved the development of a technology of its own, differing in many ways from that found in the manufacture of heavy machinery. The number of persons employed, the investment and the value of the product are of comparable magnitude in the two fields. The treatise under consideration bears somewhat the same relation to the newer industry that a book on machine design bears to the older. While the same mechanical laws apply, the emphasis differs; for example, computations for strength of parts are usually superfluous, design being governed by other considerations.

Precision bearings and pivots, springs for storing energy and for taking up shocks, damping devices, brakes, detents, escapements and certain other elements rise in importance; there is a wider choice in the materials to be utilized and in methods of fastening parts together. Perhaps because of its newness this subject has apparently not received its due share of attention.

The book is the outcome of the appointment of a technical committee in 1922, and follows a briefer publication which contented itself with a compilation of examples from practice. The various mechanical elements are taken up in order and exemplified from practice in such devices as electrical instruments, meters, galvanometers, time relays, speed counters, typewriters, phonograph motors, small speed governors and dial telephones. The list could be extended. The presentation is simple; the formulas are those of ordinary mechanics, requiring no particular mathematical aptitude for their understanding; clarity and compactness are achieved partly by the copious use of well-drawn diagrams averaging more than three to a page.

Aufbau und Entwicklungmöglichkeiten der Europäischen Elektrizitäts-Wirtschaft

Berlin: Schwarz, Goldschmidt & Company. 551 pages, 151 illustrations (36 color charts).

This is probably the most important statistical survey at present available of electrical developments in Europe, and more particularly in Germany. Only a brief summary of its scope can be given; best, perhaps, by a list of the topics. Part I contains a history of the development of electrical power in Germany; available sources of power; statistics for 1925, the year of the first official survey; service areas; influence of population and service density on electrical developments; the German high-tension network, with statistics on the length and type of conductors at various voltages, including the projected extra-high-tension system at 220 and 380 kv; economic aspects of German electrical developments. There is also a chapter on long-distance gas transmission. The second section deals with other European countries, the anticipated electrical growth during the next five years, specific projects in sight and international interconnections. The third section takes up the international affiliations of leading electrical manufacturing and holding companies and contains a table of important German and foreign plants, alphabetically indexed. In addition there is an appendix of eighteen pages of color charts and maps.

Budget Control, What It Does and How to Do It

By Ernst & Ernst, accountants and auditors, New York.

A considerably enlarged revision of a publication entitled "Budget Control," published about four years ago by Ernst & Ernst, has recently come off the press. How each part of the business budget should be prepared and the principles of effective operation, together with a summary of its benefits, are set forth in the revised edition.

The book begins by defining the budget as a plan of co-ordinating all forces and directing them toward the attainment of a definite objective. It is shown that the budget is an estimate, in advance of the factors of time, volume and value necessary to produce the definite amount of sales and profits in a given period. After covering the various advantages of budgeting, the book goes on to the practical side, showing in detail how the policy is carried out.

Technologisches Handbuch der Elektrotechnik und der Elektrochemie

By Alfred Schlomann. Berlin: Technische Wörterbücher-Verlag G.m.b.H. 966 pages, 3,493 illustrations.

Some 25,000 or 30,000 definitions, largely of terms used in electrical engineering, constitute the substance of this dictionary. A topical arrangement brings together related expressions and devices. These are co-ordinated alphabetically in a separate 158-page index. If there is a call for such a book in Germany it ought to be even more useful to the non-German reader who may occassionally be at a loss for the significance of a word, or of the designation of some element of a piece of equipment. The book is the product of numerous collaborators and was prepared under the auspices of the Verband Deutscher Elektrotechniker. It is a companion work to the illustrated dictionary in six languages previously published.

Book Note

STATISTIK DER ELEKTRIZITÄTS WERKE DER SCHWEIZ, 1927; Starkstrominspektorat des S.E.V. 111 pages, 2 charts. Zürich, General sekretariat des S.E.V.

This so-called "small edition" gives full statistics on primary electric light and power establishments with more than 500 kw. of total rating or with over 300 kw. of plant capacity: also on secondary systems, that is, those purchasing all their energy for resale, with a rating of more than 500 kw. It is stated that this abbreviated list accounts for 97 per cent of the total energy in the country and 94 per cent of the distribution. The arrangement is by individual establishments, in tabular form: the information includes capitalization as well as a large amount of physical data: plant capacity, available hydraulic horsepower, head, water storage, connected motor horsepower, allocation of energy output, number of customers and numerous other items.

Books Received

Direct Current Electricity. By Raymond Smith. New York: McGraw-Hill Book Company. 262 pages, illustrated. Price, $2.

Introduction to College Physics. By Clinton Maury Kilby, Ph.D. New York: D. Van Nostrand Company, Inc. 349 pages, illustrated.

Fortieth Biennial Report of the Railroad and Warehouse Commission of the State of Minnesota to the Governor. Minneapolis, Minn.: Syndicate Printing Company. 588 pages.

News of the Industry

Explain California Light and Power Association

A. E. Wishon and Secretary Pollard Tell Federal Trade Commission the Objects and Methods of Executives' Intercompany Group

FURTHER inquiry into West Coast utility activities was made before the Federal Trade Commission on May 2 when A. E. Wishon, former secretary of the Light and Power Association of California, and James Pollard, the present secretary, appeared to testify. Mr. Wishon, who is vice-president and general manager of the Great Western Power Company and the San Joaquin Light & Power Corporation, stated that the purpose of the association is to get executives of the eight member companies together about once a month to discuss common problems in round-table sessions. In this way agreements are reached informally and without binding force as to general problems. Such matters as the proposed water-power bills have been left for the individual companies to work out in their separate territories.

Member companies have financed the association to the extent of about $100,000 per year for the past two years, it was brought out. Of these funds the largest single use involves payment of $25,000 to $30,000 per year to the California Taxpayers' Association, which also is aided by street railway, water, banking and other institutions. The main purpose is to investigate state, county and municipal expenditures and to suggest economies which will lighten the tax burden or insure the best use of the public income, to which utility concerns, it was pointed out, are the largest contributors in the state.

The Light and Power Association also makes donations to the California Electrical Bureau, the State Irrigation Association and to other groups whose work is of benefit to the industry. Aid is given to the Scripps Laboratory of La Jolla at San Diego, engaged in rainfall studies, and to the high-tension laboratory at Stanford University. Detailed accounts and minutes of the association were not available because, it was declared, most of the records have been destroyed.

In order to keep track of the numerous bills which were introduced into the State Legislature, the association has maintained a registered legislative representative, E. P. Bromley, at Sacramento at an average cost of about $7,500 per session, including secretarial services and all expenses. Mr. Bromley spends most of his time analyzing the new legislative developments to bring out such points as concern the industry. Three of the eight association members deal in interstate sale of power, it was testified. These are the California-Oregon Power Company, the San Diego Consolidated Gas & Electric Corporation and the Southern Sierras Power Company.

On Friday, May 10, S. S. Wyer, consulting engineer, Cleveland, Ohio, author of "Niagara Falls—Its Power Possibilities and Preservation" and other pamphlets on power and other utility topics, was expected to testify. William Lavarre and Harold Hall, publishers of the Spartanburg (S. C.) *Herald*, Augusta (Ga.) *Chronicle* and Columbia (S. C.) *Record*, who were mentioned in A. R. Graustein's testimony last week, were also to appear.

Convention Arrangements Assume Shape

First List of Speakers Includes Many Men Prominent in Electrical, Business and Other Circles—Edison Expected to Attend —Wide Range of Pertinent Topics

RAPID progress is being made at the headquarters of the National Electric Light Association on the program for its fifty-second convention, to be held at Atlantic City from June 3 to 7, inclusive. As already told in the ELECTRICAL WORLD, the exhibition to be held in connection with the convention opens Friday, May 31; the dedication ceremonies of the Atlantic City Auditorium—where the convention and exhibition will be held—will be on May 31, and the initial celebrations of "Light's Golden Jubilee," as well as the festivities marking the "diamond jubilee" of Atlantic City, will take place in convention week.

Among the subjects that will be in the forefront for discussion are regulation, industrial development, research, rate making, commercial opportunities, accounting practices of the utilities, public relations, engineering developments, and the Federal Trade Commission's investigation of the electrical industry.

Men prominent outside the electrical ranks as well as leaders within them will take part in the handling of these subjects. Included among them will be: Preston S. Arkwright, president of the N.E.L.A., and other officers and members of that body; Julius H. Barnes, chairman board of directors, United States Chamber of Commerce; W. W. Freeman, president Columbia Gas & Electric Corporation; G. D. Gibbs, of Gibbs & Hill; J. J. Carty, vice-president American Telephone & Telegraph Company; W. J. Hagenah, vice-president Byllesby Engineering & Management Corporation; A. W. Robertson, chairman of the board, Westinghouse Electric & Manufacturing Company; Britton I. Budd, president Public Service Company of Northern Illinois; M. S. Sloan, president New York Edison Company; John W. Lieb, vice-president New York Edison Company; Charles L. Edgar, president Edison Electric Illuminating Company of Boston; Thomas N. McCarter, president Public Service Electric & Gas Company of New York; A. C. Marshall, vice-president Detroit Edison Company; F. R. Phillips, vice-president Duquesne Light Company; Berton Braley, author; J. R. Howard, past-president American Farm Bureau Federation; J. L. Madden, vice-president Metropolitan Life Insurance Company; W. L. Ransom, of Whitman, Ransom, Coulson & Goetz; Bernard F. Weadock, special counsel before the Federal Trade Commission, and B. C. Forbes, editor of *Forbes Magazine*.

The general session for Thursday will be in the nature of a tribute from the industry to Thomas A. Edison. Mr. Edison is expected to appear both in person and and in a talking motion picture. Henry Ford will also be on the speakers' platform to do honor to Mr. Edison. Charles L. Edgar, Thomas N. McCarter, John W. Lieb and Berton Braley will be the principal speakers.

Vice-President Curtis of the United States, together with Sir Esme Howard, the British Ambassador, and Don Alejandro Padilla y Bell, the Spanish Ambassador, will take part in the formal dedication and opening of the Atlantic City Auditorium on the evening of May 31. President Arkwright will have a prominent place in the ceremonies, which will be attended by governors and congressmen. The battleship *Wyoming* is expected to add to the brilliance of the illumination by a searchlight drill, while the dirigible *Los Angeles* circles overhead.

N.E.L.A. headquarters announce that arrangements have been completed with the Pennsylvania Railroad to run a special train from Chicago to Atlantic City for the association convention, with special pullmans from Detroit, Cleveland, St. Louis and Kansas City. The train will depart from Chicago on Sunday, June 2, at 1.15 p.m., Central standard time, arriving at Pittsburgh at 12.15 a.m. (Eastern time) and Atlantic City at 10 a.m. on Monday, June 3.

Senate Votes to Investigate Newspaper Ownership

Without a record vote and with Senator Bingham of Connecticut alone raising his voice in the negative, the United States Senate on Monday, May 6, adopted a resolution offered by Senator Walsh of Montana, asking the Postmaster General to send to the Senate full information regarding the stock ownership of certain newspapers in which the International Paper & Power Company had held a financial interest. This resolution was the outcome of the testimony of A. R. Graustein before the Federal Trade Commission last week, when he admitted that the International Paper & Power Company, of which he is president, was financially interested in thirteen or fourteen daily newspapers. Since then Frank E. Gannett has bought out the International Paper interest in Mr. Gannett's Brooklyn, Albany and Ithaca (N. Y.) journals.

In the House three bills designed to apply to acquisition of newspapers by public utility interests were introduced by Representative La Guardia of New York. These measures would compel certain procedure for publicity in the newspaper itself which, their author said, would prevent electric or gas companies, chain stores and transportation companies from buying newspapers.

New Tariff Clauses Affect Electrical Industry

Adjustment of Inconsistencies in Present Duties on Machinery Follows General Lines Recommended by N.E.M.A.—Increase of Duty on Finished Lamps

TO CORRECT the inequalities in the present tariff law governing the importation of electrical machinery and apparatus, the ways and means committee of the House of Representatives, in the tariff bill introduced Tuesday, has set up new classifications governing these imports. In the present law transformers, wiring devices and control apparatus are dutiable at 40 per cent ad valorem as manufactures of metal. Generators and motors, which are more expensive and more difficult to manufacture and which are subject to keen competition, are assessed at only 30 per cent ad valorem as machines. In addition, the interpretation of the word "machine," as applied to electrical equipment, has resulted in transferring certain equipment to the basket clause of the metals schedule. In order to provide more adequately for electrical equipment and related articles, a new paragraph is proposed as follows:

"All articles suitable for producing, rectifying, modifying, controlling or distributing electrical energy; electrical telegraph, telephone, signaling, radio, welding, ignition, wiring, therapeutic and X-ray apparatus, instruments and devices, and articles having as an essential feature an electrical element or device, such as electric motors, fans, locomotives, portable tools, furnaces, heaters, ovens, ranges, washing machines, refrigerators and signs; all the foregoing and parts thereof, finished or unfinished, wholly or in chief value of metal and not specifically provided for, 40 per cent ad valorem."

These proposed changes, it may be noted, follow in general the recommendations made by the tariff committee of the National Electrical Manufacturers' Association as noted in the ELECTRICAL WORLD for January 26 (page 211) and February 2 (page 262). Another paragraph added to the schedule devoted to metals and manufactures thereof reads:

"Illuminating or lighting fixtures, lamps, lamp bases, candelabra and candlesticks; any of the foregoing and parts thereof, finished or unfinished, not specifically provided for, if wholly or in chief value of base metal or alloy, 50 per cent ad valorem; if wholly or in chief part of, or plated with, platinum, gold or silver, 65 per cent ad valorem."

Under the present law incandescent electric light bulbs and lamps, with or without filaments, are dutiable at 20 per cent ad valorem. In the new bill lamps without filaments remain dutiable at 20 per cent, but a rate of 30 per cent ad valorem is prescribed for lamps in which the filaments have been placed.

In the States' Legislative Mills

Wisconsin Water-Power Committee Makes Six Recommendations—Nebraska League of Municipalities Bill, Passed in Modified Form, May Prove Unworkable

SIX recommendations made by the Wisconsin Legislature's interim committee on water power and electric utilities form the chief item of legislative news this week. One of them favors the state going into the business of generating and selling electric power. Others deal with rate making.

COLORADO.—A Senate bill which approves the Rio Grande water pact as negotiated by Colorado, New Mexico and Texas was passed by the Legislature and signed by Governor Adams. A House bill which provides that only by ordinance can the councils of cities of the first and second class grant franchises to public utilities was also passed and approved.

MASSACHUSETTS.—On May 2 Representative Sawyer filed an order for a special commission to investigate the methods used by the so-called "power trust" in acquiring control of properties in the commonwealth. Former Governor Fuller has expressed sympathy with the representative's desire. There were already before the Legislature the order of Representative McNulty and the petition of Representative Hagen along similar lines. Mr. Sawyer does not think further hearings are necessary, as, in his opinion, the statement made by President Comerford of the New England Power Company, at the hearing held before the Sawyer resolution was introduced, shows that the state is confronted with a "situation rather than a theory."

MISSOURI.—Hope for passage of bills outlawing collection of penalties on delinquent electric light and gas bills has been abandoned for this session. The bill by Senator Davis is languishing in the committee on municipal corporations with no chance of passing the Senate should it by any chance be reported favorably. The House bill, by Representative Meyer, likewise has no chance.

NEBRASKA.—Following his approval of the measure to permit cities of from 5,000 to 25,000 population to extend transmission lines 15 miles outside the corporate limits when contracts can be secured that will yield 15 per cent gross revenues, Governor Weaver said that the Legislature would have rendered a far greater service to the state had the bill been passed in its original form, which allowed a 25-mile extension on pledge of future earnings, and if it had also passed the companion bill, giving the same power to second-class cities and villages. Some spokesmen for the League of Municipalities say this law, the only one on its legislative program that got through in any form, is unworkable in that does not provide a method of financing construction.

Among laws passed is one that will permit Nebraska insurance companies to widen their field of investment, now largely limited to first mortgages on farm lands, and in the new list permitted are public utility bonds where the average net earnings have been not less than one and three-fourths times the interest charges on the total funded debt outstanding for not less than five years.

The Governor has vetoed the bill which prohibited cities of the second class or villages from contracting for the purchase of public property or to raise public funds by any other method than by voting bonds or levying taxes.

NEW HAMPSHIRE.—A bill passed by the New Hampshire Legislature, recently prorogued, provides that any public utility may be required to make, renew or extend power contracts with another utility upon such conditions as the Public Service Commission may order. This act assures utilities an opportunity to purchase power that otherwise might be diverted for various reasons to other channels.

WISCONSIN.—In its report to the Legislature, rendered last week, the interim committee on water power and electric utilities recommended: (1) A constitutional amendment to enable the state to recapture its water powers and to produce and sell electric power; (2) a bill to authorize formation of electric light, heat and power districts; (3) a bill enabling the Railroad Commission to treat a group of municipalities served by the same power sources as a uniform rate-making district; (4) utility com-

mittees to assist the Railroad Commission in reaching a uniform rate basis; (5) an investigation to determine whether the policy of special rates to classes of consumers is reasonable, and (6) a survey to determine whether the state should construct storage reservoirs.

Senator Thomas Duncan and Assemblymen Alvin Reis and L. L. Thayer signed the whole report, but Senators Henry Daggett and James A. Barker did not sign those portions which open the way to public ownership.

Industrial Promotion as Aid to Utilities

This with Market Development and Improved Distribution Is Among Chief Themes of Southeastern N.E.L.A. Convention at Asheville

MORE than five hundred delegates attended the Southeastern Division, N.E.L.A., convention at Asheville this week, May 8 to 10. Notable addresses, sports and entertainment features made the event abundantly worth while to the visitors.

At the opening session on Wednesday President C. A. Collier pointed out the notable trend toward utility consolidation in the South and said that this made possible universal electric service in that region and permitted many economies in utility management. He said the utilities were doing a great deal to develop the industrial possibilities of the South. They should capitalize on this feature of their service and should also develop good will by cooperating in every progressive movement for improving the region industrially. He remarked that by "monopoly" was meant merely the privilege of giving service, but that the task of the utilities at present was to intensify and exend the service they rendered. Utilities are competing for customers' dollars with other industries, he said, and they must sell as well as produce.

Nap H. Boynton outlined plans for the celebration of "Light's Golden Jubilee" and urged the South to join in the tributes to Mr. Edison. I. M. Bailey of the North Carolina Corporation Commission made an able address on utility regulation. He pointed out the trend toward federal regulation and urged that steps be taken to check this trend by developing to the fullest extent co-operation between state commissions and utilities that cross state boundaries. He believed there would be no necessity for federal regulation if the utilities and the state commissions cooperated fully in solving the problems connected with diversified security holders, non-uniform practices and interstate energy sales.

A feature of the meeting was an address by James L. Madden, a vice-president of the Metropolitan Life Insurance Company. He announced the completion of an economic and industrial survey of the United States and Canada. This survey showed that during 1926 and 1927 in six Southern states 751 industrial plants changed locations. Of these 596 were added industries and 155 represented losses in industry. The survey showed that towns of from 4,500 to 12,000 population gained the largest percentage of new industries. Of the 596 new plants, 402 represented industries developed locally, 80 were imported and 114 were branch establishments to take advantage of the market area. Labor was the primary reason given by all industries for locating in the South.

On Wednesday afternoon meetings were held by the several sections of the division. On Thursday and Friday mornings talks by Paul S. Clapp, P. S. Arkwright, C. F. Kettering, John G. Jones, L. H. Beall, Stewart L. Mims and other well-known men were scheduled. The keynote of most of these talks was market development and improved distribution.

New Officers for Southwestern N.E.L.A. and State Body

Before the adjournment of the Southwestern Division of the N.E.L.A. and the Arkansas Utilities Association's joint convention at Hot Springs, Ark., reported last week (page 896), F. W. Insull of Tulsa, president Public Service Company of Oklahoma, was elected to head the first-named body. The new vice-presidents are H. C. Couch, president Arkansas Power & Light Company, Pine Bluff, Ark.; M. T. Walker, Southwestern Gas & Electric Company, Shreveport, Miss.; B. E. Eaton, Mississippi Power Company, Gulfport, Miss., and Samuel E. Wolff, Oklahoma Power & Water Company, Sand Springs, Okla. E. E. Ehret was elected treasurer and S. J. Ballinger, San Antonio, Tex., reappointed secretary.

New officers for the Arkansas Utilities Association are: President, Robert E. Ritchie, Arkansas Power & Light Company, Pine Bluff; first vice-president, R. W. Curran, Little Rock; second vice-president, O. H. P. Moss, Blytheville; secretary and treasurer (re-elected), Rex I. Brown, Little Rock.

Other Electrical Conventions This Week

IN ADDITION to the Southeastern N.E.L.A. meeting at Asheville, N. C., two other important electrical conventions have been held this week, proceedings in each case not ending until Friday. These are the regional meeting of the American Institute of Electrical Engineers at Dallas, Tex., and the annual convention of the East Central Division, N.E.L.A., at Louisville, Ky. They will be reported in next week's issue, May 18.

Indiana Men Hear from Utility Leaders

State Electric Light Association Holds Three-Day Meeting at Gary—Farm Leader Expresses Gratitude to Power Companies for Rural Electrification

GARY, Ind., was the scene on Friday of last week of the annual meeting of the Indiana Electric Light Association, the Indiana Public Utilities Association meeting on the day before. Gary's prominence as a manufacturing city made possible unusual sightseeing tours, which included a trip through the United States Steel Corporation's mills and an inspection of the plant of the State Line Generating Company near Hammond.

On Thursday Samuel Insull, Jr., presiden Midland Utilities Company, and H. H. Allen, Halsey-Stuart Company, Chicago, were speakers. Mr. Insull described the advanced type of public service and contact work prevailing in the Hoosier State, and Mr. Allen discussed at length and interestingly the efficiency of the holding-company plan of financing. The annual dinner of the associations was held in the evening at the Hotel Gary.

On Friday an address of much interest was given by M. S. Winder of Chicago, executive secretary of the American Farm Bureau Federation, on "The Farmer's Interest in Rural Electrification." He dwelt first on growth of electrification in Middle Western states, saying that in 1924, when the committee was created, there were only 2,201 farms in the State of Illinois provided with central power-station service. Three years later, in January, 1927, the number had increased to 7,260, and on January 1, of this year, there were 13,284 electrified Illinois farms. In Indiana the figures are 3,228 in 1924, 5,100 in 1927 and 15,163 at the beginning of this year. The Michigan figures for the same dates are 2,996, 6,800 and 12,500, and for Wisconsin the figures are 7,429 in 1924, 11,000 three years later, and 20,000 for the start of this year. While farmers do not expect to dictate the rates for the service they are seeking, Mr. Winder said, they are interested in the development of rural rates on a basis which will make electricity easily obtainable and increasingly attractive. "We feel," he remarked, "that the power companies which have pioneered in this work are to be highly commended for having developed rural rates in co-operation with groups of farmers that have proved very satisfactory to the farmers. One matter in which the power companies can be of service to the farmers is in respect to advising them as to the equipment that should be installed. You power people have means which the farmers lack for determining the real merits of the equipment. The extent of the use the farmer makes of your power will be determined largely by the experience he has with the equipment he first installs."

Other speakers on the last day's pro-

gram were: Mrs. Vera Ellwood, Milwaukee Electric Railway & Light Company; J. R. Farrell, Indianapolis Power & Light Company; F. X. Mettenet, Northern Indiana Public Service Company, and D. J. Angus of the Esterline-Angus Company, Indianapolis.

Officers elected by the Indiana Electric Light Association were: President, C. V. Sorensen, Central Indiana Power Company; vice-president, C. B. Calvert, Indiana & Michigan Electric Company; secretary and treasurer (re-elected), William Stokes. The Utilities association elected a board of governors composed of C. L. Kirk, F. J. Haas, F. E. Bohn, C. H. Rotteger, H. S. Morse, W. H. Durbin, R. M. Feustel, A. W. Brady, N. A. Perry and T. F. English.

Communication Commission Bill's Wide Scope

With the opening of hearings at Washington on the Communication Commission bill introduced by Senator Couzens of Michigan, it was revealed that he plans to amend the measure so as to extend the authority of the agency to include regulation of electric power which moves interstate. Under Senator Couzens' original plan the Federal Radio Commission in effect would be expanded so as to regulate in addition the telegraph, the telephone and the cable service and the activities of persons "engaged in the transmission of intelligence for hire."

Senator Dill of Washington this week brought up the subject of radio telephony from and to moving trains, referring to published reports of successful operation in Canada and reading a statement from the Radio Protective Association attacking the American radio interests for not having instituted similar service and ascribing their not having done so to monopolistic conditions in the radio industry. This statement was referred to the committee on interstate commerce.

Lakeside to Add 60,000-Kw. Unit and Accessories

A program for additional equipment and building extension of the Lakeside power plant has been announced by the Milwaukee Electric Railway & Light Company. It will involve the expenditure of $4,200,000, and the work will start next fall. Completion by September 1, 1930, is expected. The main items include an additional 60,000-kw. turbo-generator, two 7,700-kw. turbine units, two high-pressure boilers, coal-handling equipment, electrical equipment, condenser tunnels and building extensions.

The order for the 60,000-kw. turbine has been placed with the Allis-Chalmers company. It is designed for normal operating steam pressure of 290 lb., operating at 1,800 r.p.m., and will be a 13,800-volt, 60-cycle, three-phase machine, of the same size as the turbine placed in operation last year. The smaller turbines will be purchased from the General Electric Company. The boilers will be duplicates of the one now being built at Lakeside for use by next fall. They will have a steam pressure of 1,390 lb.

When the program is completed Lakeside will have a total capacity of 310,000 kw. Work on the 1930 program will start as soon as the work now under way, at a cost of $1,500,000, is completed in the fall.

Purchases and Mergers

Merger of Associated Gas & Electric and Rochester Central Power Now Assured—Boston Edison Offers to Buy Concord Plant

ASSURED union of the Rochester Central Power Corporation with the Associated Gas & Electric Company was announced on May 3. Details of the merger have not been worked out, but E. L. Phillips and G. W. Olmstead, directors of the company first named, will also become directors of the Associated. Subsidiary to the Rochester Central Power Corporation are the New York Central Electric Corporation, the Empire Gas & Electric Company, the Rochester Gas & Electric Corporation, the Elmira Water, Light & Railroad Company, the Lockport Light, Heat & Power Company and other companies.

The Edison Electric Illuminating Company of Boston has offered to buy the municipal lighting plant and distribution system of the town of Concord, Mass., for $600,000. A town meeting will be called for May 27 to consider the matter. An alternative offer has been made by the company to sell energy wholesale to the town at a low rate on condition that the municipality defray certain line construction costs involved. At present the town operates a small steam plant not connected with any other system. Discovery that many consumers had not been billed for long periods, owing apparently, to inefficient methods, recently caused a local sensation.

The Long Island Lighting Company has petitioned the New York Public Service Commission for permission to merge the Sag Harbor (L. I.) Electric Light & Power Company.

A petition is before the New York commission from the New York State Electric Corporation for leave to acquire the outstanding capital stock of the Patchogue (Long Island) Electric Light Company.

The Lake Erie Power & Light Company of Cleveland has purchased the interests of the Gibsonburg (Ohio) Electric Light Company.

At Shenandoah, Iowa, the City Council has set June 11 as the date for a special election to vote upon a 20-year franchise for the Iowa-Nebraska Light & Power Company, which will take over the municipal plant. Three years ago the franchise was defeated.

An offer of $3,750,000 has been made by the People's Light & Power Corporation of New York to the city of Danville, Va., for its municipal electric and gas works. The sum offered is $1,000,000 more than was offered by the Appalachian Electric Power Company a year ago. The same rates as at present were offered and a twenty-year franchise asked for. The corporation is said to be planning a water-power development in Patrick County on the river dam.

Although the Appalachian Electric Power Company is building a feeder line to Tazewell, Va., it is not, despite reports to the contrary, taking over the Tazewell Electric Light & Power Company, but will serve the town independently, officials are reported as saying.

Puyallup, Wash., voted recently to buy the distribution system of the Puget Sound Power & Light Company in that city.

The City Council of Kamloops, British Columbia, has accepted the offer of $800,000 for the electric plants and a 25-year franchise of the Canadian Waterworks & Electric Company, Vancouver, as the basis of negotiations. It is expected that a by-law will be submitted to the electors early next month. The Armstrong (B. C.) city power plant has been sold to the Western Canada Hydro-Electric Company.

General Electric Engineers Play Jupiter's Role

Tests of the devices that are available for safeguarding high-tension transmission lines against lightning were made on Sunday, May 5, with a million-volt portable generator of artificial lightning. These experiments took place on the 66,000-volt system of the Turners Falls Power & Electric Company on the outskirts of Pittsfield, Mass., under the direction of K. B. McEachron, research engineer with the General Electric Company, and his assistants, who repeatedly "hurled" (in newspaper phraseology) the full voltage of their generator at the line without causing any damage. It was said to be the first time that artificial lightning at this voltage had ever been applied to a transmission line, as well as the first use of the generator, which is soon to be sent out for testing public utility transmission lines in various parts of the country.

P. G. & E. Company Orders Units for Station A

Further details on the two steam-electric generating units to be installed by the Pacific Gas & Electric Company in its Station A, at Twenty-third and Louisiana Streets, San Francisco, which is being converted from 63,000-kw. generating capacity to 225,000-kw., are now available. These units have been ordered from the General Electric Company and will have a rating of 52,500 kw. each.

Each of them consists of two elements, a high-pressure one developing approximately 15,000 kw. and a low-pressure one developing approximately 37,500 kw. The four machines will generate at about 12,000 volts. The high-pressure element of each turbine will take steam at 1,200-lb. pressure and the low-pressure element at 400-lb. pressure with temperature of 750 deg. F.

It is planned that the first unit of the rebuilt plant will be in operation early in the fall of 1930. The second unit will follow approximately six months later. The entire construction program at Station A will take five years and cost $11,000,000.

Public Versus Private Ownership Undecided in Alberta

During recent sittings of the Legislature of the Province of Alberta the question of public ownership of power has been debated pro and con, but without any definite decision having been reached. The Liberal party wants an investigation of the whole power situation and declares that meanwhile no further grants of power sites should be made. The Conservative opposition is against public ownership and seeks to commit the province to private development. The government is in favor of further investigation and holds that grants of power sites should carry provision for their recapture. The Conservative leader argues that it is not fair to the private concerns to have to continue to operate under a constant threat of expropriation. On the other hand, he says, if the government has any notion of going into the power business, it should do so before the private corporations became more completely intrenched in Alberta.

According to a report by R. Bruce Baxter, an official of the Calgary Power Company, there are a number of important power sites in Alberta within 200 miles of Edmonton which have not been developed. These include the Rocky Rapids on the North Saskatchewan River, two sites on the Athabasca River, north of Edison, and several rapids on the Athabasca in the direction of Fort McMurray. Outside of the 200-mile limit there are several other sites on the Athabasca and elsewhere. Leaving out of consideration the development of the Mid-West Power Company at Drumheller, the power supplied at Blairmore by the East Kootenay Power Company and any other isolated plants throughout the province, the report states that water-power plants at present operating on the Bow River have a rated capacity of 32,000 hp.

Following a survey of the situation, the report states that present plants and those under construction are adequate to supply the needs of the province up to 1932. At that time it anticipates the necessity for arranging storage facilities to increase the three plants on the Bow River and at the same time add somewhat to the generating equipment. This, it is estimated, would take care of the situation until 1937 or 1938.

Excellent Early Registration for Paris Conference

Notice has been given by Director J. Tribot Laspière of the International Conference on Large Electric High-Tension Systems, which will hold its biennial meeting this year at Paris on June 6 to 15, that 380 members from 21 countries have already been enrolled. It is anticipated that the attendance of the 1927 session will be exceeded. Ninety-eight papers have been sent in from eighteen different countries. Of these, 33 deal with construction, a feature being papers concerning generators, transformers and transformer oil; 33 with the construction and insulation of transmission lines, including electrical and mechanical features relating to switch gear, cables, bare conductors, insulators, overhead-line supports of steel, concrete and wood, and problems relating to their maintenance, and 32 papers with the lay-out, calculation, operation and protection of lines and networks, including problems connected with lightning effects, surges, protective relays, grounding of neutrals, snow loading, load dispatching, measurment and interstation communications.

An outline of the technical program adopted for this conference was printed in the ELECTRICAL WORLD for December 15 last (page 1215), giving also the names of official American delegates. Arrangements are in hand so that, after the conference, visits can be made to installations of technical interest in the Pyrenees, the Alps and the Riviera. It is hoped also that it will be possible to organize reunions with the Institution of Electrical Engineers of Great Britain, which purposes to hold a summer meeting in Paris in June next.

Farm Electrification West, East, South

California and New Hampshire Companies Adopt Lower Rates and Revise Rules—Minnesota College Starts New Survey—Progress in Alabama and Virginia

EFFECTIVE recently, a new schedule reducing agricultural power rates in the territory formerly served by the Coast Valleys Gas & Electric Company, Salinas, now the Coast Valleys Division of the Pacific Gas & Electric Company, was filed with the California Railroad Commission. The reduction will amount annually to about $45,000. It is the result of informal negotiations conducted by the Railroad Commission, the California Farm Bureau Federation and the Pacific Gas & Electric Company. On the same date reductions in rates to agricultural power users also went into effect in the territories of the Southern California Edison Company and of the San Joaquin Light & Power Corporation, under agreements made last year.

The Pacific Gas & Electric Company has revised its rules for building electric lines on private property in rural territory. Heretofore it has required that such lines be owned by the consumers. In the future it will build free, upon either highway or private property, 100 ft. of line for each lighting consumer, 75 ft. for each refrigerator consumer, 75 ft. for each kilowatt of heating and cooking load and 100 ft. for each horsepower of motor load of 5 hp. or over. An ordinary rural consumer, with a range, a refrigerator and a water or air heater, will be entitled under the new rule to 850 ft. of free extension of line. A 5-hp. motor will give him an added 500 ft., or 1,350 ft. in all. Under these terms four consumers would be entitled to a mile of line.

Following in line with the program of the New England Power Association and the Public Service Company of New Hampshire, the Twin State Gas & Electric Company, which is controlled by the Insull interests, has accepted the five-year monthly payment plan for the extension of electric light and power lines into the rural districts of New Hampshire. Similar attitude by the Windsor Electric Company and the Vermont Hydro-Electric Company as regards its New Hampshire operations makes the plan available in and around Rochester, Dover, Somersworth, Berlin and Claremont. Customers agree to pay in monthly installments over a period of five years a sum equal to the actual cost of the line plus transformers and meters. It is further specified that the rural line subscriber is entitled to use at the regular urban rates. Coincident with this announcement the companies named made public a reduction of approximately 25 per cent in the cost of rural extensions.

In Minnesota Steele County will furnish the proving ground for a survey as to the efficiency and practicability of power farming. Members of the faculty of the University of Minnesota's department of agriculture, with the co-operation of the Steele County farm bureau and a hundred farmers who utilize motorized machinery, are conducting the survey. The study is being directed by Dr. George A. Pond, head of the division of economics and farm management at the Agricultural College, and Prof. A. J. Schwantes of the division of agricultural engineering. Members of their staffs will aid then in gathering the material, which will be broadcast to Minnesota farmers to provide them with reliable information regarding the worth of the farm tractor as compared with that of draft animals. Steele County was chosen for the survey because its farms and farming projects offer the greatest variety of conditions and are most representative of the average Minnesota farm.

The largest single authorization by his company for rural-line extension, involving 45 projects in 32 counties and extending 295 miles, was announced by Thomas W. Martin, president of the Alabama Power Company, in a statement given out on May 1. Fifteen hundred customers not now served from central stations and a majority of whom do not enjoy electric service in any form will be added to the company's roster of rural customers. The extensions, when completed, will bring the number of counties enjoying rural serv-

ice to 58 and the total mileage for the Alabama Power Company to 1,167. The company has in the past few years constructed 249 rural lines, extending 867 miles and giving Alabama a leading position in this particular activity. All the new circuits will be pioneer feeder lines, carrying the power service into a large agricultural section.

More than $1,000,000 will probably be spent upon transmission lines to Virginia farms this year under the operation of the new rural electrification plan adopted in that state, and at least $100,000 is being set aside for immediate development in the Richmond area by the Virginia Electric & Power Company. This statement follows a meeting of the committee appointed by Governor Byrd to confer with representatives of the light and power companies. Under the new plan, a modification of the Pennsylvania method, demands can come only from sections with enough consumers to make extensions pay their own way. William E. Wood, president of the Virginia Electric & Power Company, is quoted as saying that $1,000,000 is a conservative estimate of the total amount to be expended. His own company's plans include a power line up through Midlothian and into Powhatan County that will represent an investment of about $50,000. There will be a rural electrification conference under the auspices of the agricultural engineering department of the Virginia Polytechnic Institute at Blacksburg on June 12 to 14, for which a comprehensive program has already been prepared.

Policies Division, N.E.M.A., Arranges Program

Marketing, purchasing, unfair competition and price discrimination, cost accounting and policy relations will be among the principal topics discussed at the two general sessions of the Policies Division of the National Electrical Manufacturers' Association to be held on May 18 and 20 during the spring meeting of that association at Hot Springs, Va. The sessions of the Policies Division immediately precede the spring meeting, which will close on May 25.

President Huntington B. Crouse will address the first meeting. Other addresses will include one by W. E. Sprackling, vice-president for the Supply Division, on the National Electrical Code and another on "Unfair Competition and Price Discrimination as Affected by the American Can Company Decision," by Harold Smith, general solicitor of the Westinghouse Electric & Manufacturing Company.

James L. Madden, vice-president Metropolitan Life Insurance Company, will address the second general session on May 20 on "The Changing Scene in Marketing." Edward T. Gushee, purchasing agent for the Detroit Edison Company, will talk on "Purchasing, Buying or Bargaining." Other speakers at this meeting will be Managing Director Alfred E. Waller and Thomas W. Howard, United States Chamber of Commerce, whose topic is to be "Some Possibilities of Cost Accounting."

New Standards Set by U. S. Chamber of Commerce

President Butterworth Points out Functions of the Organization in Community Development and Public Welfare—Many Resolutions Passed.

FROM many viewpoints new standards of achievement were set by the seventeenth annual meeting of the United States Chamber of Commerce, in session at Washington during the greater part of last week. Attendance records of recent years were broken, the registration climbing well above the 2,500 mark in the early part of the event. With the exception of the water-power conference reported last week, there was, however, little that bore very directly on the electrical industry.

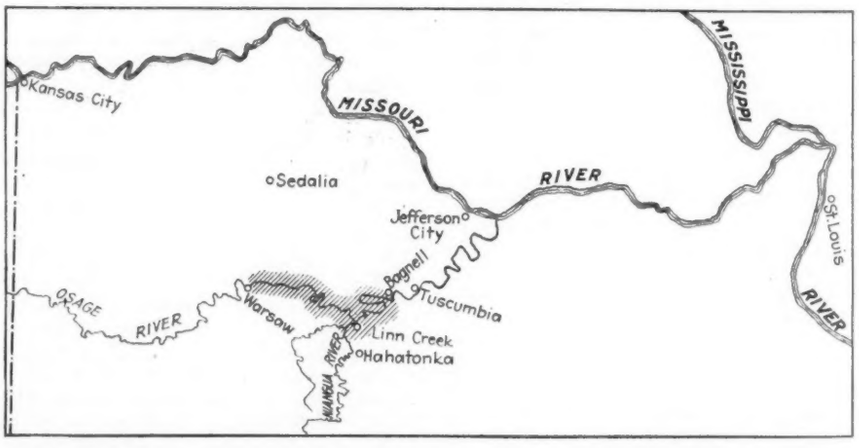
President William Butterworth in his official address said:

Experience has disclosed two particular reasons why the Chamber of Commerce is a uniquely practical agency for community development and for fostering public welfare. The first is that the Chamber of Commerce brings into one representative organization all phases of the business and industry of the community, thus making it possible, in a very real sense, for business men to pool their unselfish contributions of ideas and expert business technique and experience and to organize intelligent effort for worth while objectives of common interest. The other is that the Chamber of Commerce is part and parcel of the community and of the community life and that it takes into consideration from the broadest, all-inclusive business viewpoint the requirements of public welfare, such as education, recreation, conservation of health and the like, as well as for industrial and commercial and business development.

Resolutions dealing with the credit situation, agriculture, reduction of armaments, railroad ratemaking, the merchant marine, legal procedure, taxation, tariff, import and export prohibitions, immigration, commercial aëronautics, the mineral industries, passports, transpacific press messages, distribution studies, the forest reserves, highway appropriations, traffic regulation, daylight saving, fire waste, health conservation and accident prevention were adopted at the final session.

Julius H. Barnes was selected as the chairman of the board of directors for the ensuing year. William Butterworth was re-elected to the presidency. Among the vice-presidents W. Rufus Abbott of Chicago was elected to represent the North Central States. Charles W. Lonsdale of Kansas City was elected for the Southwestern group. The vacancy in the Northwestern vice-presidency was not filled. The other vice-presidents were re-elected as follows: Robert R. Ellis of Memphis, Southeastern States; Alfred J. Brosseau of New York, Northeastern States, and Paul Shoup of San Francisco, Western division.

Site of the Osage River Hydro Development



AS IMPLIED on April 27 (page 847), the taking over by the North American Company through its St. Louis subsidiary, the Union Electric Light & Power Company, of the Osage River hydro-electric project at Bagnell, Mo., of which the Missouri Hydro-Electric Company has been the promoter, guarantees the realization of this thirty-million-dollar project, on which work was once started several years ago.

As already stated, the plant will have an initial capacity of 160,000 hp., with a possible eventual enlargement to 213,000 hp. The dam will be 2,500 ft. long and 100 ft. high and of earth and reinforced-concrete construction. It will form a lake 125 miles long, extending up the Osage to Warsaw, Mo., and the Niangua River to Hahatonka Park. It will have an irregular shore line of about 1,400 miles and flood 60,000 acres. The town of Linn Creek, county seat of Camden County, will have to be relocated.

The contract for the construction of the dam and power plant has been awarded to the Stone & Webster Engineering Corporation. The dam and power plant will cost approximately $20,000,000 and the transmission lines and substations about $10,000,000, according to estimates made by Union Electric Light & Power engineers.

Briefer News

PUBLIC SERVICE COMPANY OF COLORADO WINS BOULDER FRANCHISE.—The Public Service Company of Colorado has obtained a twenty-year franchise to serve the city of Boulder with electric light and power. This was decided at a special election on April 23, when the vote was 1,151 to 318. A street-railway franchise also was granted.

GATINEAU POWER COMPANY STARTS ANOTHER GENERATOR IN BRYSON PLANT.—The Gatineau Power Company, one of the units of the Canadian Hydro-Electric Corporation, has started the second 25,000-hp. generator in its Bryson (Quebec) hydro-electric plant. The Bryson station is designed for 75,000 hp. in three units.

IOWA PUBLIC SERVICE TO BUILD PLANT AT SPIRIT LAKE.—Work on a small power plant for the Iowa Public Service Company has been started at Spirit Lake, Iowa, and will be completed about June 1. A 50-ft. x 100-ft. brick building will be built to contain a 675-hp. Worthington-Diesel engine with generator and other accessories at a cost of $90,000.

INSULL INTERESTS OUT OF WATER-POWER SCHEMES IN TEXAS.—Following an inspection of the Middle West Utilities Company's subsidiaries in Texas, Martin J. Insull declared that the Middle West company is completely and finally out of the water-power picture in the western part of that state, and that there is no chance of the company's reopening negotiations to build dams on the Colorado River, where a former effort resulted in strong opposition from land owners and users.

NEW 110-KV. TRANSMISSION LINE FOR VERMONT.—The People's Light & Power Corporation will build a 110-kv., 27-mile double-circuit, steel-tower transmission line from Essex Junction, Vt., to Montpelier, President E. C. Deal announces. The right-of-way has already been secured, and construction work will begin soon. The new line will replace an inadequate wooden-pole structure. The recently completed hydro-electric plant at Middlesex will feed into this line.

TWO MORE STEAM PLANTS FOR THE UNION ELECTRIC LIGHT & POWER NEEDED IN A FEW YEARS.—Construction to cost upward of $75,000,000 will be inaugurated by the Union Electric Light & Power Company of St. Louis within the next three or four years, Louis H. Egan, president of the company, announced on April 30 in an address before the St. Louis Electrical Board of Trade. This sum does not include the thirty-million-dollar Osage River hydro-electric plant. Mr. Egan prophesied that two additional power plants the size of Cahokia will soon be necessary. It is probable, he intimated, that one of the new plants will adjoin the present comparatively small plant in Venice, Ill. Another addition to Cahokia may also be decided on.

ST. PAUL ARRANGES FOR VALUATION OF NORTHERN STATES POWER COMPANY.—The St. Paul City Council has approved a contract with the Bemis Company, of which Edward Bemis is the head, for the valuation of the properties of the Northern States Power Company in the Minnesota capital with a view to checking the electric and gas rates. The contract limits the expenditure to $30,000, which the Northern States company has agreed to pay the city.

FITCHBURG, MASS., SEEKS LOWER RATES.—A citizens' appeal is before the Massachusetts Department of Public Utilities for lower electrical rates, attack being made upon those of the Fitchburg Gas & Electric Company, which are alleged to be from 11 per cent to 122 per cent higher than those of other cities and towns. The customer who is leading the agitation, Eugene A. Tincotte, propounds nine questions to the company concerning manufacturing costs, administration and the utility's relation to Charles H. Tenney & Company and to the N.E.L.A. and propaganda expenditures.

MITCHELL, S. D., PLANT TO EQUAL THAT AT ABERDEEN.—Work has started on a 5,000-kw. turbo-generator and auxiliary equipment which will triple the capacity of the Northwestern Public Service Company's power plant at Mitchell, S. D. President T. T. Parker of the company announces that the additions, which will be completed about September 1, will make the plant as large as the Aberdeen unit, the company's largest plant in South Dakota. The work will bring to completion a program of centralizing power units, and on its completion nearly all of the energy for the northern district served by the company will be supplied from Mitchell and Aberdeen.

ELECTRIFICATION AGREEMENT AT BALTIMORE IS REACHED.—By agreeing to electrify its lines through Baltimore by using underground conduits instead of overhead transmission towers, the Pennsylvania Railroad, it is thought, has ended its controversy with the city over ordinances to authorize construction of a tunnel and terminal project. The settlement was reached last week at a dinner attended by officials and counsel for the railroad, the Board of Estimates and the Mayor's advisory commission, which recommended disapproval of ordinances unless underground electrification was agreed to and opposed accepting an offer from the railroad to arbitrate the matter. Electrification is to be accomplished within five years under the terms of the measures. It is to be started after the other improvements are finished.

DES MOINES VALLEY POWER COMPANY MAKES PLANS.—Frank Maher, president of the recently organized Des Moines Valley Power Company, Fort Dodge, Iowa, announces that a permit has been issued to the company to operate in Iowa and preliminary plans for the hydro-electric plant at Kalo have been completed. Distribution lines in Webster County are already under way. The utility will not enter Fort Dodge, but plans to extend its lines into cities and rural communities in adjoining counties.

GEORGIA POWER COMPANY ADOPTS NEW INDUSTRIAL RATE.—The Georgia Power Company has filed with the Georgia Public Service Commission an optional Hopkinson kva. demand block power rate applicable to all industrial customers of the company with maximum demands of 500 kva. and over. This rate will mean a considerable reduction in power costs to those customers who accept it and install power-factor corrective apparatus. The commission has indicated its approval, and the rate will become effective on the first of next month.

EMPIRE STATE ACCOUNTING SECTION MEETS AT SCHENECTADY.—William A. Prendergast, chairman Public Service Commission of New York, was scheduled to address the annual meeting of the Accounting Section of the Empire State Gas and Electric Association at Schenectady on Thursday. Other speakers at the meeting, which had also a Friday morning session, were to be President C. S. Ruffner, James M. Seay, B. S. Rodey, Jr., F. J. Brett, G. A. Burrows, H. W. Alrich and Ordway Tead.

BOILERS ORDERED FOR 160,000-KW. GENERATOR AT HELL GATE.—Two boiler units for the Hell Gate generating station of the United Electric Light & Power Company, New York, have just been ordered from the Babcock & Wilcox Company. They will be ready for service by August, 1930. Each unit consists of twin boilers, superheaters, economizers and air heaters. The boilers will supply steam to drive one of the 160,000-kw. turbo-generators now being installed. Each will supply a maximum of 800,000 lb. of steam per hour at a temperature of 725 deg. F. at 275 lb. pressure per square inch. They will be fired by pulverized coal.

WORLD POWER CONFERENCE MEETING AT BARCELONA.—Thirty-two countries will be represented at the sectional meeting of the World Power Conference to be held in Barcelona, May 15 to May 23. Among the matters to be considered are the importance and order of preference in the utilization of water-power resources, general control of rivers, shut-off, discharge and water-level control devices, automatic devices, profitableness of utilizing water power for the production of energy in different coun-

tries, the most suitable way of increasing consumption, and the economic relation between industrial and agricultural utilization. David B. Rushmore of New York has been appointed by President Hoover to represent the United States at the conference.

SUIT AGAINST PROHIBITION OF SUBMETERING BROUGHT IN DISTRICT OF COLUMBIA.—Suit to enjoin the Public Utilities Commission of the District of Columbia and the Potomac Electric Power Company from putting into effect the recent order of the commission denying the right of owners of apartments and office buildings to sell electrical energy to their tenants by submetering has been filed in the District Supreme Court by the trustees of the Adams Building in Washington. The plaintiffs assert the commission has no right to interfere with the disposition of energy after it has been purchased from the utility corporation.

POWER PROJECT ON GAULEY RIVER IN WEST VIRGINIA DROPPED.—The application of the Gauley Power Company to construct a dam in Gauley River in the Jefferson district of Nicholas County and the Mountain Cove district of Fayette County, which had been pending before the West Virginia Public Service Commission and was to come up for hearing in March, when the applicants failed to appear, is said to have been dropped. It is understood that the rights of the Gauley Power Company were sold to a railroad enterprise needing a right-of-way. The hydro company held a preliminary permit from the Federal Power Commission and had contemplated developing 54,500 hp. on the river.

COLORADO RIVER COMMISSION NAMED BY UTAH GOVERNOR.—R. R. Lyman, W. R. Wallace and W. W. Ray, all of Salt Lake City, have been appointed by Governor Dern as the Utah Colorado River Commission created by enactment of the last Legislature. Mr. Wallace has been chairman of the Utah Water Storage Commission for several years and also has served as Colorado River Commissioner during the administration of Governor Dern. Mr. Lyman, of Lyman & Pack, civil and consulting engineers, has been vice-chairman of the Water Storage Commission. Mr. Ray, an attorney, has been actively identified with the policies of Utah's present administration relative to the Colorado River. The act creating the new commission specified that it consist of an engineer, a business man and a lawyer.

FIRST CONCRETE POURED ON STEWART MOUNTAIN DAM.—First concrete for the dam under erection by the Salt River Valley Water Users' Association, Phoenix, Ariz., on its Stewart Mountain project was poured in April. The Stewart Mountain project is the fourth step in the Salt River Valley development, the preceding ones being the Roosevelt, Horse Mesa and Mormon Flat dams and power plants. The Stewart Mountain dam wil be 180 ft. above bedrock and 1,200 ft. long over all with a 400-ft. spillway. It is of the variable-radius arch type, with gravity section on the west end and overflow section on the east end. The reservoir to be created between the Stewart Mountain and Mormon Flat dams will have a capacity of 70,000 acre-feet. The installed capacity of the power house will be 12,000 hp.

RADIO PERMITS TWO-HOUR CONVERSATION WITH MOVING TRAIN.—A new method of radio-telephonic conversation between a moving train and a stationary instrument is announced from Canada, where it has been successfully carried out on the Canadian National Railway lines. The new device throws the voice from the train to the telegraph wires which line the right-of-way of every railroad. It is then carried to the terminal point and there connected with the ordinary telephone lines. This process is reversed as regards the other participant in the conversation. As the system now stands, the terminal points must be not more than about 150 miles apart or the voice is lost. A two-hour conversation was held in this way on May 5, and several points of advantage over the German system are claimed. Experiments in perfecting the system were carried on by J. C. Burkholder, formerly with the Bell laboratory at Newark, N. J.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue for January 5, page 80.]

National Fire Protection Association—Memphis, May 13-16. A. R. Small, 109 Leonard St., New York.

Public Utilities Advertising Association—Chicago, May 14-16. T. P. Pfeiffer, Byllesby Engineering & Management Assn., Chicago.

Missouri Association of Public Utilities—Bothwell Hotel, Sedalia, May 16-18. F. D. Beardslee, 315 N. 12th St., St. Louis.

National Electrical Credit Association—Statler Hotel, St. Louis, May 16 and 17. F. P. Vose, 1008 Marquette Bldg., Chicago.

National Electrical Manufacturers' Association—The Homestead, Hot Springs, Va., May 20-25. S. N. Clarkson, 420 Lexington Ave., New York.

American Electrochemical Society—Toronto, May 27-29. C. G. Fink, Columbia University, New York.

National Electrical Wholesalers' Association—The Homestead, Hot Springs, Va., May 27-31. E. Donald Tolles, 165 Broadway, New York.

National Electric Light Association—Atlantic City, N. J., June 3-7. A. J. Marshall, 420 Lexington Ave., New York.

North Central Electric Association—Breezy Point, Pequot, Minn., June 16-18. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

Association of Iron and Steel Electrical Engineers—Pittsburgh, June 17-21. J. F. Kelly, 1007 Empire Bldg., Pittsburgh.

Canadian Electrical Association—Algonquin Hotel, St. Andrew's by the Sea, N. B., June 19-21. H. M. Lyster, 712 Power Bldg., Montreal.

Pacific Coast Electrical Association—Del Monte, Calif., June 19-22. S. H. Taylor, 447 Sutter St., San Francisco.

Society for the Promotion of Engineering Education—Ohio State University, Columbus, June 19-22. F. L. Bishop, University of Pittsburgh, Pittsburgh.

American Institute of Electrical Engineers—Swampscott, Mass., June 24-28. F. L. Hutchinson, 33 West 39th St., New York.

Northwest Electric Light and Power Association—Seattle, June 26-29. B. Snow, 1206 Spalding Bldg., Portland, Ore.

Michigan Section, N.E.L.A.—Mackinac Island, July 1-3. Herbert Silvester, Edison Bldg., Ann Arbor, Mich.

Wisconsin Utilities Association—Accounting Section, Sheboygan, June 20-21; Electric Section, Wausau, July 18-19. J. N. Cadby, 432 Broadway, Milwaukee.

STATE LINE COMPANY SUED TO ANNUL LAND TITLE ACQUIRED BY CONDEMNATION.—Four suits have been filed by Charles C. Shedd and his son Charles B. Shedd of Chicago against the State Line Generating Company and four subsidiary companies in Indiana to prevent the use of land belonging to the Shedds in that state in the construction of power lines. The Shedds' land was acquired by condemnation proceedings by the Northern Indiana Public Service Company in order to erect power lines to the new plant, which recently went into partial operation. The plaintiffs allege that after the condemnation was completed it was revealed that contracts had been made by which the generating plant would supply power to four companies, two of which are Illinois corporations serving Illinois territory. This, the Shedds maintain, is illegal.

HYDRO-ELECTRIC ENTERPRISE AT ERWIN, TENN.—Charles H. Stoll of Erwin, Tenn.; E. S. Mayes of Springfield, Ky., and Howard K. Bell of Lexington, Ky., intend to begin construction soon on a hydro-electric plant on the Nolichucky River near Erwin, where a constant development of at least 3,000 hp. is in view. In consideration of agreement to build this plant, Mr. Stoll and his associates have received from the city a twenty-year franchise to take effect on November 6, 1931. Mr. Bell, who is a hydraulic engineer, will be consulting engineer, and Prof. John A. Switzer, head of the engineering department of the University of Tennessee, will be in charge of construction, assisted by R. F. Holahan, engineer, of Erwin. There are at present applications for Nolichucky River sites before the Federal Power Commission from the Tennessee Eastern Electric Company and the Federal Power Company.

ELECTRICAL DOINGS IN BRITISH COLUMBIA.—Construction of the concrete dam in the south channel of the Kootenay River at South Slocan, near Nelson, British Columbia, which sends the river's entire flow through the north channel to drive the turbines of the 75,000-hp. No. 3 plant of the West Kootenay Power & Light Company, is virtually completed.——Contracts have been awarded for the first 42,500-hp

generating unit of the Ruskin power project of the British Columbia Electric Railway Company, Vancouver. It will cost $680,000.——The policy of the Water Board of the Provincial Lands Department of the province with regard to hydro-electric development will be shaped by the consensus of opinion of the Associated Boards of Trade of Vancouver Island in so far as power development there is affected.

WINNIPEG ELECTRIC COMPANY AND MANITOBA GOVERNMENT EXONERATED OF CORRUPT BARGAINING.—There was absolutely no evidence to show that the Manitoba government was corrupt or dishonest in its dealings with the Winnipeg Electric Company in respect to the lease of the Seven Sisters Falls power site on the Winnipeg River, according to the finding of the royal commission appointed in February to investigate charges laid by Col. F. G. Taylor, leader of the Conservative provincial party. The first four questions placed before the commission, all of which related to alleged corruption and dishonesty connected with the Seven Sisters Falls transaction, are dismissed in the report with a categorical negative. Divergence of views was encountered with regard to the fifth question, regarding campaign contributions, termed by the report relatively unimportant. The commissioners find that there were contributions made at or about the time of the Manitoba provincial elections of 1927 to the campaign funds of three parties by the Winnipeg Electric Company, but of these, they assert, neither Premier Bracken nor any member of his Cabinet had knowledge until after the Seven Sisters agreement had been completed.

Recent Court Decisions

MINNESOTA SUPREME COURT FORBIDS ELECTRIC RIGHT-OF-WAY THROUGH STATE PARK.—The Minnesota Supreme Court has reversed a decision of a lower court and held that the Minnesota Power & Light Company should not be permitted to acquire by eminent domain a right-of-way through Jay Cooke State Park, near Carlton, for construction of an electric transmission line. The company sought to take a strip 50 ft. wide and three-fourths of a mile long, running from the St. Louis River to the north boundary of the park. The strip would have cut the park in two north of the river. The Supreme Court held that such a strip would detract from the beauty and usefulness of the park and destroy trees, shrubs and plants, which the statutes prohibit.

MANUFACTURER OR INSTALLER LIABLE FOR INJURY FROM ELECTRICALLY OPERATED APPARATUS NEGLIGENTLY ERECTED.—Payton's Administrator vs. Childers Electric Company and Louisville Electric Manufacturing Company was an action to recover damages for the death of an ice-company employee who, while operating an electric crane, came into contact with an electric wire for the faulty installation of which the defendants were held responsible. The case was dismissed in the trial court, but the Court of Appeals reversed this finding so far as the Childers Electric Company was concerned, saying: "The crane or hoist was to be operated by electricity and if negligently constructed or installed would be dangerous to those operating it. If properly constructed and installed, it was not inherently dangerous merely because it was operated by electricity, but, if negligently constructed or installed, it would become dangerous when put to the use intended. Considerations of public policy demand that the utmost care and caution be exacted from the manufacturer and installer of electrical machinery, and the operator has a right to rely upon the implied representation that the machinery is properly installed and free from defects."

CORPORATE ENTITY OF TELEPHONE COMPANY OWNING ONLY INSIGNIFICANT FRACTION OF ITS STOCK A FICTION.—To the Michigan Bell Telephone Company, shown to be owned to the extent of 99.99 per cent of its stock by the American Telephone & Telegraph Company, the Michigan Supreme Court denied any recognition as a corporate entity, regarding such a pretense as a legal fiction. The court declared the Michigan company to be merely an operating unit of the holding company—a decision that, if sustained, may have an important bearing on holding companies in general. The action was one brought by the Attorney-General of the state in the name of the people to oust the company of its franchise. The court, instead of handing down a general judgment of ouster, rendered a judgment ousting the Michigan concern of the contract right to have credit, in the computation of rates, for payments to the parent company. The court declared that the contract was not binding because the subsidiary was not operated as a separate entity in accordance with statutory provisions. In this connection the court said: "We think it is also apparent that a purpose of the separate entity is to avoid full investigation and control by the Public Utilities Commission of the state to the injury of the public."

THAT POWER WIRES WERE UNINSULATED AND ONLY 24 FT. ABOVE GROUND NOT NEGLIGENCE PER SE.—In Reardon vs. Florida West Coast Power Corporation suit for damages was brought because of the death of a locomotive driver who was killed by electric shock just after he had stopped his train and approached a grading machine of which the high crane had come into contact with the electric company's transmission wires. These were strung on poles 24 ft. above the ground and were uninsulated. Negligence was charged. The Supreme Court of Florida sustained the dismissal of the case by the trial court, on the ground that the facts about the installation just stated did not in themselves constitute negligence or breach of duty by the company. The company would, the court said, have been shown to be negligent had it been proved that it had permitted the dangerous condition to continue after being notified concerning it, but the allegations as to the fact of notification, the time of such notice before the decedent arrived on the scene and the continuous contact of the road machine with the wires were deficient. Whether the victim was lacking in ordinary care the court did not decide. (120 So. 842.)*

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

MISSOURI COMMISSION JUSTIFIES REFUSAL TO SERVE PREMISES WHERE "METER JUMPER" HAD BEEN FOUND.—The Missouri Public Service Commission has dismissed a complaint against the Union Electric Light & Power Company of St. Louis by a customer occupying premises where the company had discontinued and refused to restore service. The company's defense was that its inspectors had found a "meter jumper" in use, and this, the commission held, was sufficient warrant for cessation of service.

COMMISSION DISAPPROVES OF ANY FIXED PLAN TO CARE FOR ISOLATED CUSTOMERS.—The Connecticut Public Utilities Commission in holding reasonable the policy of the Torrington Electric Light Company to ask a guarantee from rural consumers of at least a 20 per cent gross return on the cost of extending service expressed its opinion that no fixed, uniform plan should be adopted to care for the cost of extending service to more or less isolated customers, but that each individual case should be adjusted on its merits. The commission said: "Different plans have been adopted in making such extensions, some approved by the commission and some by mutual agreement between the company and the prospective patrons, but all involving some additional payment over and above the regular rates. In some cases cash or equivalent contributions have been made toward the cost of constructing the line, the patrons then receiving the service at regular rates; in other cases a guarantee that the company will receive an annual gross revenue of at least a stated amount for a term of years, and in still other cases an increased rate for the customers along the extension, or a combination of increased rate and guarantee whereby the company is assured of at least a stated amount of annual gross revenue for a term of years, etc. Certain companies have adopted rules pertaining to such extensions, some companies establishing a predetermined fixed charge per customer per month for each 100 ft. of extension in excess of the ordinary free extension service, irrespective of the total cost of the extension, while other companies have established a predetermined fixed charge per customer per mile, the amount depending upon the number of customers per mile and irrespective of the cost of the extension. It is difficult to adopt any fixed plan which will meet conditions in every case. Where a number of patrons contribute toward the cost of construction or guarantee the company a certain annual gross revenue for a term of years, and after the service is installed other persons along the extension demand and receive service at regular rates, such original patrons justly feel that they are discriminated against. The surest way to guard against such discrimination is to establish a special rate applicable to all takers, both present and future, along such extension, such rate being sufficiently high to provide the annual gross revenue necessary to warrant the extension. Such a plan in certain cases, however, would require so high a rate as to be prohibitive for some and thereby defeat the purpose of the extension. The combination of an increased rate by way of an increased monthly minimum and a guarantee of the necessary total gross revenue would serve in this case to meet best the situation."

News About Men of the Industry

Fred W. Insull Heads Southwestern Division

Fred W. Insull, president and general manager of the Southwestern Light & Power Company and president of the Public Service Company of Oklahoma, has been elected president of the Southwestern Geographic Division of the National Electric Light Association at the recent convention held in Hot Springs, Ark. As an executive officer of light and power companies Mr. Insull's responsibilities are heavy, but in spite of his official duties, he has found time to participate actively in association affairs in the Southwest, to say nothing of his contributions to civic movements and state development work. He has been chairman of the electric light and power division, a member of the executive board since 1920 and for two terms president of the Oklahoma Utilities Association and he is a member of the executive board of the Southwestern Geographic Division of the National Electric Light Association. He is a past-president of the Tulsa Chamber of Commerce and at present is chairman of the industrial committee of that organization. He is also a member of the board of directors of the state chamber of commerce and a director of the Tulsa Finance Corporation, formed to sponsor the establishment of new industries in Oklahoma.

A. E. Bettis New President Middle West Division

A. E. Bettis, vice-president and chief engineer of the Kansas City Power & Light Company, Kansas City, Mo., was elected to the presidency of the Middle West Division of the National Electric Light Association at the recent annual convention in Omaha on April 26. Mr. Bettis is well known in the electrical industry, having been active in N.E.L.A. affairs for a number of years, and is a past-vice-president of the American Institute of Electrical Engineers. He was born and educated in Kansas City and entered the employ of the Kansas City utility in 1904. During the period he has been associated with the company he has served as chief civil and mechanical engineer, chief engineer and superintendent of engineering and construction, which carried with it authority over the construction, maintenance, operating, trouble and various departments of a similar kind. It was in 1924 that he was advanced to the office of vice-president.

Mr. Bettis served for a period of seven years on the electrical apparatus committee of the National Electric Light Association and in addition to being active in the American Institute of Electrical Engineers he is a member of the American Society of Mechanical Engineers and other similar organizations.

B. E. Morrow Named Chief Engineer by Michigan Utility

B. E. Morrow, for many years manager of production and transmission for the Consumers Power Company, Jackson, Mich., has been appointed chief engineer of that utility. Mr. Morrow has been with the Consumers organization since November, 1915, and in that period of nearly fourteen years' service at the head of the production and transmission department he has seen the system double and quadruple in size, power resources, number of customers and volume of business. Mr. Morrow's experience in the electrical industry goes back to the days of Thomas A. Edison's early experimental work when he was associated with Mr. Edison at Schenectady, N. Y., during the late '80s and early '90s. He first became connected with the Edison Electric Company at Schenectady in 1888, assisting Mr. Edison personally in some of his studies. He was in the testing department of the General Electric Company when the first alternator was built by the Edison Machine Works and assisted Mr. Edison and Dr. A. E. Kennelly in the test on this first machine. In 1902 he resigned from the General Electric Company to take charge of the operating department of the Hudson River Power Transmission Company, which was later merged with other companies to form the Hudson River Electric Power Company.

Mr. Morrow has been active in N.E.L.A. committee work and has given considerable attention to the subject of safety. In 1917 he was elected a director of the National Safety Council and since joining the Consumers organization he has had charge of all accident prevention work. He has been a member of the committee on dangerous machinery appointed by the Department of Labor, New York City; a member of the committee on accident prevention of the N.E.L.A. and chairman of the safety practice committee of the Public Utilities Section of the National Safety Council.

C. S. Banghart Removes to Pennsylvania

C. S. Banghart, vice-president and general manager of the Staten Island Edison Corporation, is leaving about May 15 to assume the duties of vice-president and general manager of a group of properties (Metropolitan Edison Company) recently acquired by the Associated Gas & Electric System with headquarters at Reading, Pa.

Mr. Banghart attended Lehigh University, South Bethlehem, Pa. After leaving school he was employed on the electrification of the Allentown & Bethlehem Rapid Transit Company, Allentown, Pa., and the Union Railroad, New York City. Subsequently he became identified with the Flushing-College Point Light, Power & Railroad Company, Interstate Railroad, Reading, Pa.; the New York & Queens County Railroad, Long Island City, N. Y.; the Binghamton Railroad, and the Augusta-Aiken Railroad. In the summer of 1923 he was transferred to Staten Island as vice-president and general manager of the Richmond Light & Railroad Company and Staten Island Edison Corporation.

J. S. Tritle Assumes Broader Duties

J. S. Tritle, formerly general manager of the Westinghouse Electric & Manufacturing Company's merchandising department, with headquarters in Mansfield, Ohio, has assumed responsibility and authority for manufacturing operations of the company, according to an announcement by F. A. Merrick, vice-president and general manager. A native of Nevada and a Yale graduate, Mr. Tritle has been an active member of the electrical industry since 1893. He became associated with the Westinghouse company in 1905 and for a number of years occupied important positions in the management of district office sales work. In 1922 he was made manager of the merchandising department, in which position he directed the sales activities of this work. In 1925, when a separate division was made of this activity, he was made general manager of the merchandising department, overseeing engineering and manufacturing as well as sales work.

A. W. Robertson, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company was elected a director of the Chamber

of Commerce of the United States for the department of transportation and communication at the recent annual meeting in Washington.

H. L. Geisse Appointed to Executive Position

Harold L. Geisse, for several years general manager of the Wisconsin Valley Electric Company, has been elected vice-president of that company, according to an announcement made by Halford Erickson, vice-president H. M. Byllesby & Company. Mr. Geisse is well qualified to assume these executive duties at Wausau, having had a broad background of experience in utility work in Wisconsin. Following graduation from the University of Wisconsin he became statistician for the Railroad Commission of Wisconsin and then, after spending one year with the San Antonio Gas, Electric & Traction Company in Texas, he returned to the commission, subsequently becoming secretary. He left the commission to become identified with the Insull interests, at first as assistant to the president of one of the property groups and then as secretary and treasurer of a group of properties in Wisconsin. It was in 1921 that he joined the Wisconsin Valley Electric Company. Mr. Geisse is a past-president of the Wisconsin Utilities Association.

DR. JULIUS KLEIN, Assistant Secretary of the Department of Commerce, has returned from Europe after a short sojourn abroad.

JOHN B. KLUMPP has resigned as a vice-president of the United Gas Improvement Company, after 35 years of continuous service, to open offices as utility consultant in Philadelphia. Following graduation from Stevens Institute of Technology in 1894, he entered the engineering department of the United Gas Improvement Company. From 1904 to 1919 Mr. Klumpp made examinations and reported on all the utility properties, both gas and electric, which the United Gas Improvement Company investigated and purchased. He specialized in legal engineering, valuations and rate matters. Later Mr. Klumpp was made assistant general manager of the U. G. I. and has been a vice-president for the past five years.

DAVID B. RUSHMORE, who retired four years ago as consulting engineer of the General Electric Company, has been appointed by President Hoover to represent the United States at the meeting of the World Power Conference in Barcelona, Spain, this month. During his professional career Mr. Rushmore has been a leader whose influence has been felt in every line of industrial power activity in the electrical industry. When he resigned early in 1925 he brought to a close a period of service with the General Electric Company which covered 25 years. Mr. Rushmore has represented this country at previous meetings of the World Power Conference.

MATTHEW S. SLOAN, president of the New York Edison Company and affiliated companies, was re-elected a director of the Chamber of Commerce of the United States for the department of natural resources production at the recent annual meeting in Washington. Mr. Sloan was first elected a director of the national chamber in 1927.

ARNOLD E. KRIEGSMANN has been named assistant to C. W. Tippy, general manager of the Consumers Power Company, Jackson, Mich., to succeed Walter H. Sammis, who assumed new duties in New York. Mr. Kriegsmann became identified with the Consumers organization in 1920, the following year being appointed electrical distribution superintendent of the Kalamazoo district, where he remained until 1926. At that time he was transferred to New York as assistant to E. J. Bechtel, in charge of the railway properties of Hodenpyl, Hardy & Company, Inc. More recently he has been with Stevens & Wood, Inc., as industrial engineer. In that capacity he has spent a portion of this year in Michigan engaged in an industrial survey of the state.

H. P. Davis to Conduct Radio Operations

Because of the increasing activities of the Westinghouse Electric & Manufacturing Company in the radio field and in the affairs of various companies allied in radio operations and development, Vice-President H. P. Davis, formerly in charge of Westinghouse manufacturing operations, will devote his entire attention to the radio operations of his company. A graduate of the Worcester Polytechnic Institute and an outstanding leader in the electrical industry, Mr. Davis is internationally known as the "Father of Radio Broadcasting" for his work in developing radio broadcasting through the establishment of station KDKA, in 1920. He has been associated with the Westinghouse company since 1891 and has been a vice-president since 1911. Mr. Davis has to his credit a number of inventions, covering controllers, rheostats, arc lamps, switches, instruments, railroad and railway apparatus. He is a member of the American Institute of Electrical Engineers, the Engineering Society of Western Pennsylvania and the Chamber of Commerce and the Board of Trade of Pittsburgh.

Leon E. Seekins Goes to Worcester

Leon E. Seekins has been appointed vice-president and general manager of the Worcester (Mass.) Electric Light Company following its acquisition by the New England Power Association. Mr. Seekins is a native of Maine and was graduated from the University of Maine in 1913 with the degree of electrical engineer. After a short period with the General Electric Company in the Schenectady works he joined the staff of the Lowell (Mass.) Electric Light Company, serving in various departments and ultimately becoming power sales engineer. In 1927 he was transferred to the Cape Breton Electric Company, Ltd., as general manager with headquarters at Sydney, N. S., returning in 1928 to become general manager of the Lowell company upon its entry into the New England Power Association.

Mr. Seekins has been active in the New England Association of Central Station Power Engineers and took a prominent part in civic movements while in Cape Breton and Lowell.

Obituary

FREDERICK R. SLATER, vice-president in charge of public relations of the Queens Borough Gas & Electric Company, Far Rockaway, N. Y., died May 4, at his home in Yonkers, N. Y., after an illness of two weeks. Born in Washington, D. C., in 1872, he attended Cornell University, from which he was graduated with degrees of mechanical engineer and electrical engineer. After graduation he designed a new power station for Columbia University, afterward joining the Otis Elevator Company as a designing engineer of elevator machinery. Subsequently he joined the forces of the Manhattan Railway Company of New York City as assistant engineer, converting its lines from steam to electric operation. Later he became a member of the engineering staff building the New York subway and was made principal assistant engineer of the Interborough Rapid Transit Company. For about six years he was with the firm of Latey & Slater, consulting engineers in the design and installation of electric railway equipment. For six years he was with the Texas Light & Power Company, Dallas, Tex., as general superintendent and afterward as vice-president and general manager. Before joining the Queens Borough company, about two years ago, Mr. Slater was identified with the Moody Engineering Company.

Financial and Statistical News

AN UPWARD movement of substantial proportions got under way in the utility common stocks early this week and several substantial advances were made. In the face of 14 per cent money early in the week a number of the utility issues advanced sharply, while the rest of the market was fairly evenly divided between gains and losses.

——THE STIMULUS TO HEAVY BUYING IN THE UTILITIES seems to have been largely rumors of impending acquisitions of certain properties by some of the larger holding groups. United Corporation, according to these rumors, is a heavy purchaser in a great many systems. Buying of Allied Power & Light, Columbia Gas & Electric and other stocks is attributed rather persistently to the United group.

——AMERICAN SUPERPOWER A and B stocks figured prominently in the week's activity, selling up about 19 points one session and down around 7 the next. Southeastern Power & Light advanced steadily well over its previous high, with fairly heavy buying. Other favored issues were Electric Investors, American Gas & Electric, North American, Columbia Gas & Electric, etc.

California Oregon Power Plans Exchange of Stock

Application has been made by the California Oregon Power Company to the California Railroad Commission for authority to issue $1,665,100 of 6 per cent preferred stock, series of 1927, in exchange for an equal amount of its 7 per cent preferred stock; also to sell to Standard Gas & Electric Company $1,500,000 of common stock for cash for the purpose of financing construction expenditures.

Columbia Gas & Electric Issues Rights

Directors of the Columbia Gas & Electric Corporation at a recent meeting voted to issue rights to a total of $31,500,000 to holders of its common stock of record June 15, 1929. The directors authorized the offering of 843,284 additional shares of common stock of the corporation for subscription at $24 per share by holders of common stock, in the ratio of one additional share for each ten shares held of June 15. At the current market price for the common stock the aggregate value of the rights is equivalent to about 1½ times the amount of the new capital ($20,238,816) to be raised through this financing. Rights will expire at the close of business August 15, 1929. Subscriptions will be payable in three installments: $8 per share on August 15, $8 per share on November 15 and $7.64 per share February 15, 1930, the latter including adjustment for interest at the rate of 6 per cent per annum on each installment from the due date thereof to February 15 amounting to $0.36 per share.

Proceeds from this issue of additional common shares will be used, according to President Philip G. Gossler, to reimburse the treasury of the corporation for advances made to subsidiaries for their construction and other requirements, and for other general corporate purposes. The common stock, which is of no-par value, is on a per annum dividend basis of $2, the initial quarterly dividend of 50 cents per share being payable May 15 to stock of record April 20. There are 8,432,840 shares outstanding or issuable as a result of the recent split-up.

Southern Sierras Power to Float Bond Issue

Authorization has been granted by the California Railroad Commission to the Southern Sierras Power Company, Riverside, Calif., to issue and sell at not less than par $708,500 of first and refunding mortgage bonds, series C, due Jan. 1, 1965, and bearing interest at the rate of 6 per cent per annum, for the purpose of financing the cost of additions and betterments.

United Corporation Expands Its Utility Holdings

Further interest in the utility field is secured by the Morgan-Drexel-Bonbright banking group through the acquisition by the United Corporation of substantial holdings in the United Gas Improvement Company. The United Corporation has acquired through exchange of its own stock practically all of the 500,000 shares of the United Gas Improvement Company's stock to which it limited its offer recently, thereby becoming the largest single stockholder in the United Gas Improvement Company. It was announced this week by the United Corporation that "its offer of March 1, 1929, to receive tenders for the exchange of not to exceed 500,000 shares of capital stock of United Gas Improvement Company for shares of the $3 cumulative preference stock and common stock of the United Corporation on the basis of one share of the United Gas Improvement Company capital stock for 1½ shares of the $3 cumulative preference stock and 2¼ shares of the common stock of the United Corporation will terminate May 9 or prior thereto when tenders under this offer shall have aggregated 500,000 shares."

While not officially substantiated, it was rumored in financial circles that the United Corporation was also buying heavily in the Allied Power & Light Corporation.

New Issue Proposed by Associated Gas

With the purpose of increasing its authorized class A stock to 8,000,000 shares, Associated Gas & Electric Company has called a special meeting of stockholders for June 1. It is also the purpose of the meeting to authorize the directors in their discretion to pay noncumulative dividends on the class A and B stocks not exceeding 50 cents a share in any one year in addition to the regular priority dividends, and to provide that if the dividend on the common stock exceeds that on the class B stock the latter shall receive additional dividends equal to such excess. This provision is not to affect the class A stock, which will be entitled still to participate in one-half the surplus remaining after payment of dividends on the class B and common stocks equal in the aggregate to the dividends paid on the class A stock.

It is understood that the purpose of the proposed increase in the authorized class A stock is to permit an offering of rights to holders of class A, class B and common stocks at an early date and for future purposes. The other changes in the certificate of incorporation proposed are to facilitate the payment of extra dividends on the class A stock and to give the management stock, or class B stock, some participation in additional earnings, according to the letter to stockholders announcing the meeting.

U.G.I. Reveals Terms of General Gas Sale

The price paid by the Associated Gas & Electric Company to the United Gas Improvement Company for its holdings of class A and B shares of General Gas & Electric was stated to be $46,725,525 at the annual meeting of the United Gas Improvement Company this week. Class A stock was transferred on a $90 basis, class B for $110 and dividend participations for $33 each.

This transaction gave Gas Securities

Corporation a profit exceeding $7,000,000, it is understood. United Gas Improvement Company owns 87 per cent of the latter company's stock.

The statement given out after the meeting in part follows:

Since the publication of the stockholders' report Gas Securities Corporation has sold to the Associated Gas & Electric Company at an advantageous price the securities held by it in General Gas & Electric Corporation, the consideration therefor being $46,725,525.

Settlement was made by a secured obligation of the Associated Gas & Electric Company due October 31, 1929, with interest at the rate of 6 per cent per annum.

An understanding was also reached whereby other stockholders of General Gas & Electric Corporation will be given an opportunity to sell their shares of stock and participation certificates by Associated Gas & Electric Company at the same price as that obtained by your company.

When your company made its investment in the securities of General Gas & Electric Corporation it did so because of its belief in the future of their subsidiaries and because they were convinced that the investment so made was bound to increase in value.

In view of the announcement made by General Gas & Electric Corporation under date of April 19 that it had sold its principal subsidiaries to the Associated Gas & Electric Company, and in view of the advantageous offer made by the Associated Gas & Electric Company, it seemed to your officers and directors that a sale was preferable to that of continuing to hold the investment made in Gas Securities Corporation.

Regards Money Tightness as Cause of Concern

With business generally in satisfactory shape from the standpoint of both volume and profits, the one jarring note of importance lies in the continued tightness of money which manifests itself in the highest rates of interest since the deflation period of 1920-21, and in the stagnation of the bond market, says the current letter of the National City Bank. Although thus far business has shown surprisingly little adverse effect from these unfavorable conditions, partly due to the policy of banks in granting preferential rates to industry, and partly to the success of many corporations in financing long term needs through stocks in lieu of bonds, it would be contrary to the experience of the past for this immunity to be continued indefinitely. Unless some way is soon found whereby the existing credit situation can be cured and rates restored to normal levels it is difficult to see how a check to business can be long postponed.

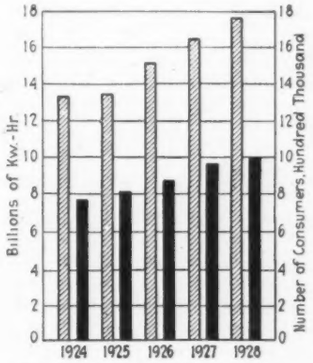
Already the tight money conditions have affected building, and the volume of new construction work coming forward in recent months has shown a considerable decline. According to the records of the F. W. Dodge Corporation, the value of new contracts awarded during the first quarter of the year fell 15 per cent behind those of the first quarter of last year, with the loss centered chiefly in residential building, which was off 34 per cent, and public works and utilities, which were down 18 per cent, while other non-residential contracts were up 11 per cent.

While it is true that incomplete figures for April would indicate some revival of activity, it is to be doubted that so long as speculation on the stock exchanges continues to absorb so large a proportion of the surplus funds of the country the building industry can attain that full measure of prosperity without which business loses one of its most important sustaining influences.

Pacific Gas & Electric Assets Up 16 per Cent

SHOWING a growth of more than 16 per cent in its assets since the end of 1927, the Pacific Gas & Electric Company closed another prosperous and profitable year. While gross revenue increased only slightly more than 6 per cent, net income was up over 8 per cent, indicating a stability of operating costs. The operating ratio in fact was reduced from almost 51 per cent to slightly over 49.

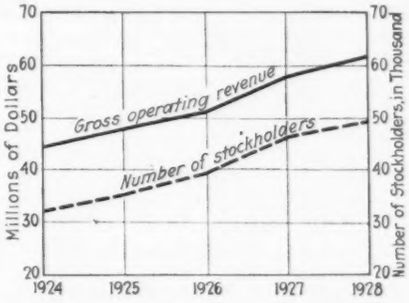
It is significant that a large part of the growth in assets was in plant and equipment, indicating the steady increase in demand for service. Electric customers increased by 22,319 to 529,306 during 1928 and total customers by 477,012 to 1,004,340. Reduced rates both for electricity and for gas resulted in a saving of more than $2,300,000 annually to customers. Of this, about $2,000,000 represents voluntary reductions in electric rates. With minor exceptions the company's top rate for electric energy for domestic purposes is now 5 cents per kilowatt-hour in all cities and towns in which it operates and 6 cents per kilowatt-hour in all rural territory, with graduated reductions down to 1½ cents for larger usage.



Growth in Electrical Sales and Consumers

Coincident with its rate reduction, the company instituted the most vigorous and comprehensive load building campaign in its history, involving the expenditure of almost $1,000,000 for advertising and sales work. Results were most gratifying. Contracts signed in 1928 for new business yielded an estimated annual revenue of $4,579,298, exclusive of routine applications for service. Naturally this was only partly reflected in 1928 earnings.

The financial status of the company's securities indicates a thoroughly sound position. Bond interest has been earned between 2½ and three times for many years. Last year the ratio was 2.96. Earnings on common stock have been substantial for a long period. Last year's earnings amounted to $3.17 per share on the average amount of common stock outstanding during the year, or



Increase in Revenue and Stockholders Covering Five-Year Period

$3.05 on the amount outstanding at the end of the year. The current price of around 57 is about eighteen times earnings. Valuable privileges to purchase rights were extended.

Fairbanks, Morse Report

Fairbanks, Morse & Company reports for the quarter ended March 31, 1929, a net income of $406,760 after depreciation, interest and federal taxes, equivalent, after allowing for dividend requirements on 7 per cent preferred stock, to 77 cents a share earned on 368,977 no-par shares of common stock. This compares with $409,448, or 77 cents a share, on common in the first quarter of 1928.

The income account for the quarter ended March 31, 1929, compares as follows:

	1929	1928	1927
Gross income	$2,275,299	$2,332,945	$1,836,285
Expenses, depreciation, etc.	1,813,072	1,859,595	1,720,578
Federal taxes	55,467	63,902	15,620
Net income	$406,760	$409,448	$100,087
Preferred dividends	122,106	123,870	127,054
Common dividends	276,653	276,653	276,610
Surplus	$8,001	$8,925	*$303,577

*Deficit.

"While actual shipments for the first quarter amounted to only $6,131,119, the total orders received aggregated $8,346,553, the difference representing an increase in the unfilled orders on hand

Current Earnings Reports of Electric Light and Power Companies

	1929	1928	Per Cent Increase	Operating Ratio 1929	Operating Ratio 1928
American Light & Traction & Subs (Year ended March 31)					
Gross revenue	$43,635,695	$36,734,054	18.8	54	53
Net revenue	19,974,819	17,035,678	17.2	..	..
American Water Works & Electric & Subs. (Year ended March 31)					
Gross revenue	51,598,792	49,228,067	4.8	50	53
Gross income	25,468,715	23,118,772	10.2	..	..
Associated Gas & Electric System (Year ended Feb. 28)					
Gross earnings	47,437,778	40,208,589	18.0	55	55
Net earnings	21,262,938	18,017,352	18.0	..	..
Columbia Gas & Electric & Subs. (Year ended March 31)					
Gross earnings	109,950,972	99,501,712	10.5	57	58
Net earnings	48,014,389	41,519,241	15.6	..	..
Consumers Power (Year ended March 31)					
Gross earnings	31,436,851	27,578,019	14.0	49	51
Net earnings	15,955,807	13,449,232	18.6	..	..
Eastern Utilities Associates & Subs. (Year ended March 31)					
Gross revenue	8,758,107	8,347,673	4.9	..	..
Net revenue	3,368,015	2,989,074	12.7	..	..
Engineers Public Service & Subs. (Year ended March 31)					
Gross earnings	37,632,835	29,994,587	25.4	58	61
Net earnings	15,793,337	11,703,138	35.0	..	..
Galveston-Houston Electric & Subs. (Year ended March 31)					
Gross earnings	5,252,217	5,147,911	2.0	..	..
Net earnings	1,701,087	1,665,847	2.1	..	..
General Gas & Electric & Subs. (Year ended March 31)					
Operating revenue	19,509,441	23,830,217—22.2		42	44
Net operating revenue	11,260,293	13,361,769—18.7		..	..
Illinois Power & Light & Subs. (Year ended Feb. 28)					
Gross earnings	$35,439,685	$31,521,742	12.4	56	59
Net earnings	15,356,134	12,656,658	21.2	..	..
North American Co. & Subs. (Year ended March 31)					
Gross earnings	141,515,695	122,906,742	15.1	52	53
Net earnings	67,340,093	58,021,915	16.0	..	..
Penn-Ohio Edison and Northern Ohio Power (Year ended March 31)					
Gross revenue	28,198,415	26,627,295	5.9	60	63
Net revenue	11,304,537	9,814,614	15.2	..	..
Portland Electric Power (Year ended March 31)					
Gross revenue	12,600,992	12,224,228	3.1	59	59
Net revenue	5,115,877	5,005,414	2.2	..	..
Public Service Corp. of New Jersey & Subs. (Year ended March 31)					
Gross earnings	127,702,532	117,941,186	8.3	..	..
Net earnings*	37,906,299	33,773,584	12.2	..	..
Puget Sound Power & Light & Subs. (Year ended March 31)					
Gross earnings	15,421,546	14,934,360	3.3	..	..
Net earnings	6,420,820	6,489,581	1.7	..	..
Southern California Edison (Year ended March 31)					
Gross earnings	36,426,571	31,430,850	16.0	34	33
Net earnings	23,891,726	21,101,363	13.0	..	..
Tennessee Electric Power (Year ended March 31)					
Gross earnings	13,626,112	12,760,388	6.8	51	54
Net earnings	6,644,461	5,813,298	14.3	..	..
Virginia Electric & Power & Subs. (Year ended March 31)					
Gross earnings	16,448,021	15,679,692	4.9	..	..
Net earnings	7,216,902	6,449,214	11.9	..	..

*After operating expenses, maintenance, taxes and depreciation.

compared with the amount at the beginning of the year, the benefit from which will accrue in the coming months," said W. S. Hovey, president.

Anaconda Copper Has Successful Year

The net income of the Anaconda Copper Mining Company and subsidiary companies for 1928 amounts to approximately $40,000,000 after all deductions. This is equivalent to $11.14 a share on the no-par common stock outstanding at the end of the year, as against earnings of $3.37 a share in 1927.

Last year's business established a record for the company, as a result of an enormous increase in consumption. The total income was $291,199,087, against $200,538,653 in 1927.

The company's balance sheet as of December 31 shows total current assets of $117,738,409, while current liabilities were $51,740,902. The increase in income was due both to increased copper prices and to the expansion of the company's operations.

INTERNATIONAL SUPERPOWER HOLDINGS IN FOREIGN UTILITIES.—A list of the International Superpower Corporation holdings published recently revealed the fact that that organization had invested in the leading utility undertakings in Spain, France, Italy, Germany and other countries. Among the Spanish utilities is the Barcelona Light & Power Company, Ltd., which has been making progress under Canadian management in developing hydro-electric power in Spain. Also represented is the Compañia Hispaño-Americana de Electricidad. In France holdings include the Compagnie Electrique de la Loire et du Centre, known as Loire & Central Electric Company, and Union d'Electricité operating in Paris. Three leading Italian enterprises are included —Società Meridionale di Electricità or Meridionale Electric Company, the United Electric Service Company of Italy and the Italian Superpower Corporation. The two German companies in which International Superpower has invested are the Hamburg Electric Company and the Rhine Westphalia Electric Company.

Toho Electric Power Company Reports Increased Earnings

For the year ended October 31, 1928, the Toho Electric Power Company, Ltd., reported revenues amounting to 55,161,374 yen, as compared with 52,180,493 yen for the year ended October 31, 1927, and gross income after expenses of 20,794,914 yen, as against 20,662,028. Expenses, including maintenance and depreciation (including legal reserve), and taxes totaled 34,366,459 yen, as compared with 31,518,465 in the preceding year. The number of lighting customers at the end of October, 1928, was 988,304 and the power customers numbered 49,072, an increase of 27,290 over the total of the same period of 1927. During the year the increase in the number of meters installed was 12,163, making 99,027 meters connected to the company's system on October 31, 1928.

The company had in operation 33 water-power stations and eleven steam-power stations, with total installed capacity of 228,658 kw., at the end of October, 1928. The company's transmission lines covered 1,240 route-miles.

Energy Generated and Purchased

Year	Generated	Purchased	Total
1924	367,190,521	398,914,568	766,105,089
1925	383,697,780	369,790,309	853,488,089
1926	423,090,789	527,289,656	950,380,445
1927	600,638,426	523,182,203	1,123,820,629
1928	651,963,340	611,005,398	1,262,958,738

containing 1,595 circuit-miles. The distribution lines consisted of approximately 8,585 route-miles, their length of wire and cable extending over 30,290 miles.

SHANGHAI POWER COMPANY ORGANIZED.—The Shanghai Power Company has been incorporated in Delaware by the American & Foreign Power Company and associates to take over the electric light and power system of Shanghai, China, which was acquired last month for approximately $50,000,000. The initial capital of the new company consists of 1,000 shares of common stock.

INGERSOLL-RAND INCREASES DIVIDEND RATE.—Directors of the Ingersoll-Rand Company on May 1 declared an extra dividend of $1.25 per share and a dividend of $1 per share on the common stock, no par value, both payable June 1 to holders of record May 11. Previously quarterly dividends of 75 cents per share had been paid, the last payment at this rate having been made on March 1.

Business News and Market Conditions

British Raise Electric Cable Prices

A general increase in the price of electric cables was announced in April by the British Cable Makers' Association. The soaring price of copper has caused anxiety in the electrical trade for several months and the increases have been expected for some time. The selling prices of electric cables are usually stated as percentage deviations from standard lists, the traders' discounts being a further deduction. This naturally involves somewhat complicated calculations for consultants and contractors working out tenders, so that net trade lists are issued by most of the manufacturers to their trade customers. The discounts are not affected by the amended prices.

The smallest sizes of vulcanized rubber (taped and braided) cables, which are largely used for the lighting and power circuit wiring of houses and buildings, show increases of 3d. to 1s. (6 to 24 cents) per 100 yd. Above 0.007 square inch the cable prices are subject to a much larger increase, and 10 per cent appears to apply to many of these sizes for the various grades. Above 0.1 square inch the larger proportion of copper has entailed greater increases, and the selling price is now only 20 per cent off the standard lists, compared with 35 per cent before the increases took effect. The prices of tough rubber cables and lead-covered cables have been increased.

Metal Market Inactive; Undertone Firm

Inactivity continued to feature the non-ferrous metal markets during the last week. Firmer undertones have appeared in the markets for the more important metals, however, and the immediate outlook is somewhat more promising for at least a continuation of present price levels in most instances. The minor metals are quotably unchanged.

Demand for copper, both for domestic and foreign account, has been notably light during the week ended Wednesday. Foreign business, however, though considerably below normal, has been the largest for any week since late March. Various factors in the trade interpret this improvement to portend an even greater improvement that seems certain to result from settlement of the reparations question, generally considered to be an event scheduled for the immediate future. Copper Exporters, Inc., maintains its price at 18.30 cents per pound, c.i.f. usual European destinations.

NEW YORK METAL MARKET PRICES

	May 1, 1929 Cents per Pound	May 8, 1929 Cents per Pound
Copper, electrolytic	18	18
Lead, Am. S. & R. price	7.00	7.00
Antimony	9.0625	9.00
Nickel, ingot	35	35
Zinc, spot	6.95	6.975
Tin, Straits	43.75	44.375
Aluminum, 99 per cent.	24.30	24.30

Base copper wire price May 8, 1929, 19¼ cents.

Value of Electrical Exports for the First Quarter of 1929

(Data Furnished by the Bureau of Foreign and Domestic Commerce)

Article	Three Months Ended March 31 1928	1929
Generators:		
Direct current—		
Under 500 kw.	$314,407	$295,473
500 kw. and over	296,429	142,013
Alternating current—		
Under 2,000 kva.	51,568	61,139
2,000 kva. and over	141,888	.....
Steam turbine generator sets	157,269	316,661
Accessories and parts for generators	286,142	229,931
Self-contained lighting outfits	287,855	337,954
Batteries:		
Flashlight batteries	754,973	983,403
Other dry and wet cell primary batteries	675,835	.....
Radio B and C batteries (dry)	.....	312,978
Other, not elsewhere specified	.....	429,526
Storage batteries	806,510	922,392
Transforming or converting apparatus:		
Power transformers, 500 kva. and over	358,021	308,456
Distribution transformers, less than 500 kva.	167,546	342,837
Instrument transformers	22,640	32,050
Other transformers, not elsewhere specified	174,007	303,457
Complete battery chargers under 15 amps.	58,149	81,038
Rectifiers, double-current and motor-generators, dynamotors, synchronous, and other converters	300,198	266,877
Transmission and distribution apparatus:		
Switchboard panels, except telephone	470,454	427,478
Switches and circuit breakers over 10 amps.	418,162	520,163
Fuses and fuse blocks	98,237	186,960
Watt-hour and other measuring meters	218,908	388,548
Electrical indicating instruments	78,710	168,025
Electrical recording instruments	52,663	80,643
Other electrical testing apparatus	245,445	301,181
Lightning arresters, choke coils, reactors, and other protective devices	193,985	265,728
Motors, starters, and controllers:		
Motors, ¼ hp. and under	$434,376	$690,754
Motors, over ¼ and under 1 hp.	211,847	193,505
Stationary motors—		
1 to 200 hp.	703,012	946,993
Over 200 hp.	129,844	99,615
Railway motors	237,111	169,958
Electric locomotives—		
Railway	379,132	136,142
Mining and industrial	138,165	95,520
Station and warehouse electric motor trucks	31,769	52,795
Starting and controlling equipment—		
For industrial motors	460,873	476,965
For electric railway and vehicle motors	21,046	24,031
Portable electric tools	304,866	.....
Portable electric tools except automotive	.....	405,369
Automotive electric machine tools	.....	9,586
Accessories and parts for motors	558,059	871,829
Electric appliances:		
Electric fans	245,360	293,081
Electric lamps—		
Metal filament	350,233	371,214
Other electric lamps	171,369	175,693
Flashlights	676,285	769,785
Searchlights and projectors	150,708	187,503
Motor driven household devices		
Electric household washing machines	380,793	403,816
Electric vacuum cleaners	264,255	345,376
Other motor-driven devices, except tools	221,077	268,256
Electric flatirons	60,509	94,733
Electric cooking ranges		
Other domestic heating and cooking devices	87,838	124,170
Domestic heating and cooking devices	218,527	247,636
Industrial electric furnaces and ovens	71,070	143,774
Therapeutic apparatus, x-ray machines, galvanic and faradic batteries, etc.	407,423	507,889
Signal and communication devices:		
Radio apparatus	$2,275,549	$3,849,896
Telegraph and telephone apparatus	1,032,812	1,296,018
Railway signals, switches, and attachments	112,969	160,309
Bells, buzzers, annunciators, and alarms	89,092	95,399
Other electric apparatus:		
Spark plugs	213,441	681,934
Other starting, lighting, and ignition equipment	284,736	475,651
Insulating material	337,906	381,402
Metal conduit, outlet, and switch boxes	309,937	371,980
Sockets, receptacles, and lighting switches	455,125	595,636
Electric interior lighting fixtures	502,702	729,352
Electric street lighting fixtures	139,763	173,812
Other wiring supplies and line material	249,083	335,954
Other electrical apparatus not elsewhere specified	1,762,425	3,327,771
Rubber and friction tape	100,581	131,464
Globes and shades for lighting fixtures	143,252	193,549
Electrical glassware except for lighting	92,287	136,768
Electrical porcelain:		
For less than 6,600 volts	145,924	220,456
For 6,600 volts and over	173,165	265,165
Carbons, carbon brushes, and electrodes:		
Electrodes for elec. furnaces	589,433	582,595
Other carbon products	183,909	252,052
Insulated wire and cable, iron or steel	61,608	138,865
Copper, bare wire	541,656	988,845
Copper, insulated wire and cable	1,125,081	1,916,604
Refrigeration sets up to 1 ton capacity	1,080,664	.....
Refrigeration sets up to 1 ton capacity	.....	1,953,373
Refrigeration sets over 1 to 1 ton capacity	.....	673,593
Domestic washing machines		
Totals	$25,548,648	$35,719,342

Market Conditions

NEW ENGLAND reports that aside from some negotiations under way for material for new plant development there is a preponderance of small orders.

——INDUSTRIAL BUSINESS IN THE EAST is still advancing, overcoming a slight lag. Small motor and auxiliary equipment show a renewed demand.

——THROUGHOUT THE SOUTHEAST there are evidences of a substantial volume of industrial business impending, although current orders are largely routine. Copper wire and cable orders are coming in satisfactorily.

——EQUIPMENT ORDERS FROM THE RAILROADS IN THE MIDDLE WEST showed a gain. The volume of business during the past week was about normal. Weather conditions caused a slight slump in some lines.

——ON THE WEST COAST WIRE AND ELECTRICAL MACHINERY ORDERS predominate. Many distribution transformers sold indicate a healthy condition.

Industrial Business Active in Southeast

Such activities as are reported for the Southeast are routine in nature, though the total volume of orders is holding up satisfactorily. Few new industrial projects are reported, but there is a satisfactory amount of this business still pending. Suspension insulator orders amounting to $25,000 each were placed by a Georgia power company and an Alabama company. One company placed two orders for copper wire and cable totaling $22,000, while a Florida company ordered lead cable amounting to $18,000. One company's arrester orders aggregated $20,700, while its creosoted pine pole orders amounted to $16,500. Some other central-station orders were for insulators amounting to $12,000, transformers totaling $9,700, switching equipment costing $7,100, meters amounting to $2,400, control battery costing $2,000 and crossarms totaling $1,800. A tobacco plant in North Carolina has let an electrification contract involving electrical materials to the extent of $25,000 and a cotton mill electrification contract recently let in South Carolina will call for $22,000 in electrical equipment and materials. Another recently let electrification project in the Carolinas will call for $20,000 in electrical equipment and materials. A mine locomotive costing $2,500 was ordered from the Birmingham district. Construction projects are as follows:

The Appalachian Electric Power Company, Bluefield, W. Va., plans a power substation at Ivanhoe, Va., to cost $100,000. The Southern Chair & Novelty Corporation, Martinsville, Va., will build an addition to cost $70,000. The Standard Paper Manufacturing Company, Richmond, Va., plans an addition to cost $150,000. The International Harvester Company, Chicago, will build a storage and distributing plant at Memphis, Tenn., to cost $100,000, and a storage and distributing plant at Charlotte, N. C., to cost $100,000. The Carbon Hill Overall Company, Carbon Hill, Ala., will build a mill to cost $85,000. Milledgeville, Ga., plans a floodlighting system for its municipal airport. The Fort Pierce Financing & Construction Company, Fort Pierce, Fla., plans an ice-manufacturing and precooling plant to cost $600,000. McPhail's Chocolates, Inc., Jacksonville, Fla., plans a candy factory to cost $175,000. The Florida Public Service Company, Orlando, Fla., will electrify its ice-manufacturing plant at Wauchula, Fla.

Industrial Account Advances in Eastern District

Industrial business shows an improvement in the Eastern district. After exhibiting a tendency to lag for a few weeks past, renewed demand has ensued for generator sets, motors and auxiliary power equipment. A rayon mill in northern New York has placed an order for a turbo-generator set to cost $100,000. A New Jersey manufacturer of electric lamp machinery has contracted for industrial motors to an amount of $30,000. There is a brisk demand for fractional horsepower motors and for induction disk motors for clock drives, units for refrigerating service and for vacuum cleaners. Motor units for oil burner service show reduced sales.

Central-station business continues under a good uniformity. There is a good demand for switching apparatus, oil circuit breakers and kindred equipment. A central New York power company has contracted for switching apparatus, including a switchboard, to cost $35,000. A northern New Jersey central station has placed an order for similar equipment to cost $25,000. Another New York utility company has purchased substation apparatus, including oil circuit breakers and regulators, to cost $20,000, while an Ohio central station has given a contract to a New York maker for synchronous condensers for a substation installation to cost $26,000. A Pennsylvania manufacturer is furnishing a generator unit, with transformers and affiliated equipment, for a hydro-electric power installation in Tennessee and the water turbines will be supplied by a Middle West maker.

Line materials are recording fair commitments, but the wire and cable business shows no change. A manufacturer of fuses says that trade is quiet and that inquiries are lagging and the best demand is for cartridge fuses, while plug fuses are securing little attention. A manufacturer of electric refrigerators reports a record business, with orders and shipments about 100 per cent in excess of those at a year ago this time. A maker of gas-electric locomotives states that business is better and a contract has been secured for equipment for such a unit to cost $70,000. Battery locomotives, likewise, give promise, and an order has been received from a metropolitan interest for an installation to cost $100,000. Construction projects are as follows:

The Signal Supply Officer, Signal Section, New York General Depot, Brooklyn, will receive bids until May 21 for motor-generators in lots of 20 to 150, panels in lots of 20 to 150, and power units in lots of 20 to 100 (Circular 143); at the same time, for 200 transformers, 3,000 terminals, 100 rheostats, relays, armatures, etc. (Circular 145), also at the same time for 100 volt-meters and 100 ammeters (Circular 144). The New York *Times*, New York, will build a printing plant in Brooklyn to cost $1,000,000. The Bagdad Copper Corporation, New York, plans a concentrating mill at Hillside, Ariz., to cost $500,000. Burke & Olsen, Brooklyn, architects, have plans for an ice-manufacturing plant at Corona, L. I., to cost $180,000. The Kohler Company, Kohler, Wis., manufacturer of sanitary ware, will build a factory branch and distributing plant at Long Island City, to cost $100,000. The United States Veterans' Bureau, Washington, is asking for bids until June 7 for electrical work, refrigerating and ice-making machinery, electric elevators, etc., for a proposed veterans' hospital at Somerset Hills, N. J. The State Department of Institutions and Agencies, Trenton, N. J., will build a power plant at the state hospital at Hillsdale, N. J. The Funk Printing Press Company, Roselle, N. J., will build a plant at Princeton Junction, N. J., to cost $100,000. The Gulf Refining Company, Philadelphia, will build an addition to its local oil plant to cost $150,000. The Franklin and Marshall College, Lancaster, Pa., plans a laboratory building to cost $250,000. The Heintz Manufacturing Company, Philadelphia, will build an addition to its steel body manufacturing plant to cost $65,000. The Board of District Commissioners, Washington, will receive bids until May 17 for an electrical switchboard and auxiliary equipment. The Bureau of Supplies and Accounts, Navy Department, Washington, will receive bids until May 21 for 6,600 storage battery separators for the Mare Island navy yard (Schedule 929) and at the same time for lighting and power wire (Schedule 947.)

Small Orders Prevail in New England

A slight lagging in orders, especially in heavy industrial equipment, is noted in the New England district. Small orders are plentiful for small motors, switch and control and scheduled materials. Negotiations are under way for a number of orders to be placed soon. Projects involving over 150,000 kw. for a new plant development are being considered by one group of engineers and

new equipment for an Eastern power plant amounting to about $30,000 will be purchased soon. Small motor demands are steady and during the past week one group of small motors amounting to $3,400 was sold, while a prominent manufacturer totaled sales amounting to over $53,000. Small switch and control equipment sales are steady and are generally in small lots. Equipment for a 700-kw. hydro-electric station in northern Vermont, consisting of a waterwheel, generator and transformers, was recently purchased. Construction projects are as follows:

The Peoples Light & Power Corporation, Burlington, Vt., will build a 110,000-volt steel tower transmission line from Essex Junction to Montpelier, Vt. The Lynn Gas & Electric Company, Lynn, Mass., plans a power plant, to cost $400,000. The Lux Clock Manufacturing Company, Waterbury, Conn., will build an addition to cost $100,000.

Substantial Business Reported in Middle West

The volume of business is substantially the same as last week in the Middle West with a slight increase in general employment. Mail order sales reported by the large mail order houses in Chicago show an increase of 35 per cent for the month of April over the same period last year, while retail trade is reported to be approximately 10 per cent ahead of last year. The railroads are purchasing considerable equipment and car loadings are high and well diversified. The utility companies are busy with a large amount of construction work, while maintenance purchasing is relatively large with numerous orders being placed for spare parts. Interesting orders that have been placed include one for labor and material to construct additions to a switching structure costing $250,000, one for labor and material to construct an addition to a substation costing $150,000, two air heaters complete with appurtenances and several construction orders for line extensions valued at $60,000. Jobbers' sales continue to hold up well. Construction projects are as follows:

The Detroit Paper Products Corporation, Detroit, will make expansions to cost $100,000. The Eclipse Counterbore Company, Detroit, will build an addition to cost $85,000. The Hudson Motor Car Company, Detroit, will build an addition to cost $150,000. The Lansing Stamping & Tool Company, Lansing, Mich., will build an addition to cost $100,000. The Pressed Metals of America, Port Huron, Mich., will make extensions to cost $125,000. The Auto Specialties Manufacturing Company, St. Joseph, Mich., will build an addition to cost $180,000. The Chicago Screw Company, Chicago, will build an addition to cost $150,000. Philip Ruxton, Inc., Chicago, will build an addition to its ink-manufacturing plant to cost $175,000. The Keystone Steel & Wire Company, South Bartonville, Ill., plans a power plant, to cost $45,000. The Standard Oil Company of Indiana, Chicago, plans a storage and distributing plant at Tilton, Ill., to cost $100,000. The John Baumgarth Company, Chicago, plans a paper goods plant at South Bend, Ind., to cost $200,000. The Indiana State Normal School, Terre Haute, Ind., plans a power plant to cost $70,000. The Heekin Can Company, Cincinnati, Ohio, will build an addition to cost $150,000. The Central Steel & Iron Company, Dayton, Ohio, plans an addition to cost $85,000. The Dayton Light, Heat & Power Company, Dayton, Ohio, plans an addition to cost $200,000. The Holiday Steel & Iron Company, Dayton, Ohio, will build a plant to cost $100,000. The Northwestern Public Service Company, Huron, S. D., will make extensions in its power plant at Mitchell, S. D., to cost $400,000.

Wire and Machinery Sales Good on Pacific Coast

Copper wire and electrical machinery featured the past week on the Pacific Coast, the Pacific Gas & Electric Company having bought one carload each of sizes Nos. 6, 2 and 1/0 weatherproof and the city of Glendale, Calif., being in the market for one carload of No. 2/0 bare copper. Power company machinery purchasing includes two transformers of 1,500 kva. each for the Great Western Power Company in Sacramento, Calif., $75,000 worth of Westinghouse transformers for a new Pacific Gas & Electric steam plant in San Francisco, a 15,000-kva. transformer valued at $60,000 for San Diego, Calif., and $240,000 worth of Westinghouse circuit breakers for a southern California system. Industrial machinery business includes $15,000 worth of motors for a shipbuilding company, $60,000 worth of small motors for an oil burner manufacturer, a 2,700-hp. hoist motor and controls valued at $100,000 for an Arizona copper mine, $25,000 worth of motors for a pumping plant manufacturer in Pomona, Calif., and an $8,000 pump motor and control equipment for a sugar refining company at Crockett, Calif. The first spell of hot weather reacted immediately on the fan business, releasing shipments scheduled for June. Distributing transformers also were affected, the various manufacturers in the Bay region reporting a weekly aggregate of 650. Contractors' business is very fair, with many small jobs well distributed over the territory and several big jobs almost ready for award.

In the Puget Sound district awards for oil circuit breakers for unit No. 2 of the Lake Cushman hydro project by the city of Tacoma, Wash., include $35,072 worth to the Kelman Electric & Manufacturing Company of Los Angeles, $13,400 worth to the General Electric Company and $47,814 worth to the Westinghouse company. A contract for furnishing approximately $300,000 worth of passenger elevators, including eleven motors and control apparatus, for a 22-story office building in Seattle was signed. The motor sales that were reported were light and scattered. The Puget Sound Power & Light Company reported a sale of 661 electric ranges in the Puget Sound district during April. The Seattle City Council on May 6 passed an ordinance authorizing preparation of plans and calling bids for the construction of a 2,100-ft. tunnel from the Diablo dam to the site of the power house, estimated to cost $1,000,000. The Puget Sound Power & Light Company expects to call bids shortly for a 35,000-kw. turbine, costing about $500,000 for the second unit of the Shuffleton steam plant and the city of Tacoma is taking bids until May 20 for one two-unit motor-generator set, consisting of a 700-kva., 4,000-volt, three-phase, synchronous motor, 500-kw., 550/600-volt generator, direct-connected exciter, motor control panel and generator control panel and accessories. The city of Seattle is taking bids for 2,000 lb. of B. and P. tape. Construction projects are as follows:

The Bureau of Supplies and Accounts, Navy Department, Washington, will receive bids until May 21 for one engine-driven generator set and spare parts for the San Francisco navy yard (Schedule 926). The Pacific Gas & Electric Company, San Francisco, plans a power substation at Bolinas, Calif., to cost $70,000, including transmission line; and at Concord, Calif., to cost $20,000. The Figadota Canneries, Inc., Los Angeles, will build a fruit canning plant at Perris, Calif., to cost $200,000. San Francisco, Los Angeles and Martinez, Calif., plan ornamental lighting systems. The Pioneer Sand & Gravel Company, Seattle, Wash., plans a plant to cost $350,000. The Idaho Falls Cold Storage Company, Idaho Falls, Idaho, plans an ice and cold storage plant to cost $65,000. The Commandant, Twelfth Naval District, San Francisco, will receive bids until May 22 for a 4,000-volt transmission line at the naval ammunition depot, Hawthorne, Nev. The Arizona Edison Company, Phoenix, Ariz., contemplates a hydro-electric power plant of the Gila River, to cost $200,000.

Power Apparatus Sales in St. Louis District

The continued cool weather and heavy rains in the St. Louis district have resulted in a perceptible decrease in the volume of sales in some lines of electrical apparatus as well as construction and line materials. One of the large Southwestern distributing companies bought power line intercommunicating equipment to connect twelve stations, the total cost being $55,000. A steam railway company contracted for two switchboards and battery charging equipment to cost $5,000 and a miscellaneous lot of auxiliary motors for a sugar mill in the Philippine Islands amounting to $22,000. The first continuous conveyor type of electric enameling furnace to be installed in this district was sold to an Illinois company for $23,000. Construction projects are as follows:

The Oklahoma Mill & Elevator Company, Oklahoma City, Okla., plans an addition to cost $125,000. The Public Service Company of Oklahoma, Tulsa, Okla., plans an underground conduit system in the business district. The Banfield Brothers Packing Company, Tulsa, Okla., plans a packing plant at Fort Smith, Ark., to cost $90,000. The Arkansas Light & Water Company, Huntsville, Ark., plans an electric light and power plant, and an ice-manufacturing plant to cost $75,000. Jonesboro, Ark., plans extensions in its municipal light and power plant, to cost $35,000. The Southwest Dairy Products Company, Texarkana, Ark., contemplates a milk condensing plant at Little Rock, Ark., to cost $350,000. The Newport Canning Company, Newport, Ark., plans a canning plant to cost $80,000.

Activities of the Trade

Leeds & Northrup Company Expands Operations

By purchase of adjoining property the Leeds & Northrup Company, Philadelphia, has just secured 19,000 additional square feet of property, including about 85,000 sq.ft. of additional floor space, in a modern one-story building which will be made integral with the present building by means of a connecting wing, on the construction of which work has already begun.

The expansion of the Leeds & Northrup Company's business affects practically all of its sales division, including automatic control and recording instruments for temperature in industry, Hump & Homo furnace equipment for the accurate heat treatment of steel and other metals, the automatic meter control of combustion in boiler-fired furnaces, conductivity equipment for automatic control in process industries, frequency control for central stations and automatic power plant instruments in general, in addition to Leeds & Northrup's line of precision measuring instruments for educational, laboratory and research purposes.

British Columbia Electric Contracts Let

Contracts for the first 42,500-hp. generating unit for the power plant of the British Columbia Electric Railway, involving an aggregate expenditure amounting to about $680,000, have been awarded to Canadian firms. A contract for a generator, which will be of vertical shaft type and one of the largest of its class in Canada, has been let to the Canadian Westinghouse, Hamilton, Ont. The construction of the hydraulic turbine has been awarded to the Dominion Engineering Works, Ltd., of Montreal. Four step-up transformers will be built at the Canadian General Electric plant at Toronto, Ont. The weight and size of this heavy machinery will involve a special problem in transportation, say British Columbia electrical engineers, and much of the work of assembling the unit will be done at the site of the plant. While this is only the first generating unit, foundations will be laid in the new plant for four others of similar size and design.

Westinghouse Subsidiary Buys McGraw Wholesale Division

The McGraw Electric Company, Omaha, Neb., has sold its entire wholesale electrical supply business at Sioux City, Iowa, and Omaha, Neb., to Julius Andrae & Sons Company, a subsidiary of the Westinghouse Electric & Manufacturing Company, and has acquired with the proceeds of that sale the Bussman Manufacturing Company of St. Louis, manufacturer of fuses, and the Waters, Genter Company of Minneapolis, manufacturer of electrical appliances. Due to many other interests the McGraw Electric Company decided to dispose of the wholesale part of its business, which was transferred to the new owners on April 29.

Those units of the McGraw Electric Company which have had their headquarters heretofore in Omaha, namely, the Central West Public Service Company and the Clark Electric Water Heater Division, will continue to operate from their present Omaha address as before and will occupy one floor of the present Omaha building.

General Electric Holds First Central Station Conference

Forty merchandising managers from as many leading utilities throughout the country met in the General Electric refrigeration department at Cleveland, for the first time, to discuss ways and means of better capitalizing public interest in electric refrigeration, to the advantage of all concerned. Discussions were held pertaining to utility selling campaigns versus year-round selling, methods of handling campaigns, their value, quotas, systems of compensating salesmen, value of educational exhibits and the value of concentrating on only one appliance during a campaign. Central-station men as well as General Electric officials participated in these and other discussions pertaining to the industry.

Westinghouse Receives Switching Orders

An order from the Edison Light & Power Company of York, Pa., for eight outdoor switch houses was received recently by the Westinghouse Electric & Manufacturing Company. Five of these houses are for automatic reclosing feeders containing the necessary automatic relays, together with type B2 motor-operated circuit breakers. The three other houses are to contain manually operated breakers together with the necessary relaying equipment for proper protection.

The Leominster Electric Light & Power Company at Leominster, Mass., awarded the Westinghouse Company an order for a type G-22 73-kv. breaker and a type 0-241 15-kv. breaker, each of which is to be equipped with automatic reclosing equipment. The G-22 and 0-241 breakers are mounted on their own frames and reclosing relays are mounted in the structure on the breaker frames. The B-32 breaker, which is rated at 2,000 amp. maximum, is mounted in an outdoor switch house and the reclosing relays are mounted on a steel panel in the house.

THE KELVINATOR CORPORATION, Detroit, announces the appointment of two new distributors: The Electrical Supply Company, New Orleans, La., which will distribute the complete Kelvinator line of domestic and commercial electric refrigerators and cabinets through its dealers throughout the state of Louisiana and in southern Mississippi, and the Stratton Warren Hardware Company, Memphis, Tenn., which will cover western Tennessee, northern Mississippi and southeastern Missouri.

THE GOLD SEAL ELECTRICAL COMPANY, Cleveland, manufacturer of household electrical appliances, has completed negotiations for the acquisition of the Lumb factory at Main and North Water Streets, Poughkeepsie, N. Y., and production will start as soon as possible after the installation of the machinery. The Lumb building will afford about 16,000 sq.ft. of floor space. W. E. Duff is president of the company and L. E. Dorfman is sales manager.

THE GENERAL ELECTRIC COMPANY paid more than half a million dollars in pensions during 1928, the majority of the $514,495 going to pensioners from the various apparatus works. Since the inception of the pension plan in 1912 a total of $2,129,471 has been paid through 1928. On January 1, 1928, there were 607 pensioners and at the end of the year there were 877.

THE ROBBINS & MYERS COMPANY, Springfield, Ohio, manufacturer of electric motors, generators and fans, announces a complete new line of improved electric and hand power cranes, hoists and trolleys up to 10 tons capacity. Frank F. Seaman has been appointed general manager of the Robbins & Myers crane and hoist division and Carl E. Schirmer has been made chief engineer. The sales will be in charge of John R. Mears, while Albert Kreh, William J. Scott and John J. Becker are district sales managers for New York, Chicago and Detroit, respectively. The men of the new division were all formerly associated with the Chisholm-Moore Manufacturing Company of Cleveland.

THE UNION METAL MANUFACTURING COMPANY, Canton, Ohio, announces the opening of three new district offices. The Southeastern district office, in charge of C. A. Williams, is located at 1508 Candler Building, Atlanta, Ga. L. Mitchell has charge of the Southwestern office, with headquarters at 728 Allen Building, Dallas, Tex., and the Boston office, located at 378 Stuart Street, is managed by E. H. Bradley. These offices will serve as sales headquarters for Union metal steel lighting standards, fluted steel poles, exterior lighting fixtures and "King" ferronite lighting standards.

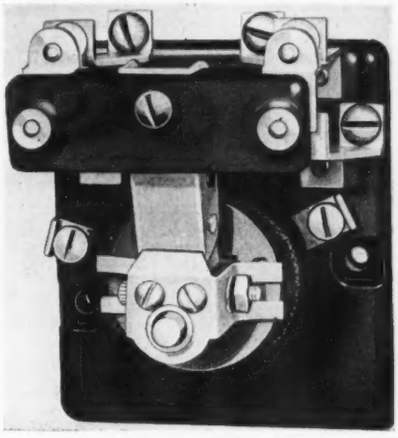
HENRY D. SEARS, 80 Boylston Street, Boston, general sales agent for "Weber" wiring devices, announces that his Chicago office and warehouse have been removed to 118 South Clinton Street.

New Equipment Available

Alternating-Current Contactors

A new line of small alternating-current contactors for electric ranges, water heaters, steam vulcanizers, fire alarms, oil burners, refrigerators, traffic signal systems and other applications requiring an automatic control switch of small capacity is announced by the Allen-Bradley Company, 286 Greenfield Avenue, Milwaukee, Wis.

The new alternating-current contactor is provided with silver, double-brake contacts and the entire assembly is



mounted on a molded Bakelite base. All switch parts are cadmium plated to prevent corrosion. These switches can be provided for operation on 6, 12, 24, 110, or 220 volts and for any frequency from 25 to 60 cycles. Current ratings range from 15 to 30 amp. Two-wire or three-wire control can be used with any type of pilot control device. The contactors can be provided with steel inclosing cabinets if desired.

Melting Pots with Bottom Pouring Spout

An electric metal melting pot, type RP, form F, with a bottom pouring spout, is announced by the General Electric Company. The bottom pouring feature is particularly applicable in cases where it is impractical to ladle and where large quantities of metal are handled. It would apply, for example, to the printing industry, for the remelting and repigging of type metal, and to railway shops and automotive factories for the casting of babbitt bearings. It is designed for melting lead, babbitt, tin, solder, type metal and similar alloys or metals, except spelter or zinc, at temperatures not exceeding 950 deg. F.

The automotive control consists of an automatic control panel and a temperature control instrument. Manual control is not recommended.

The advantages claimed are: First, heat is generated right in the metal, affording quick heating and low radiation loss; second, heating units are easily replaceable without interrupting production; third, the maximum rate of heating is obtaining without overheating; fourth, the pots are reliable, safe and economical.

Twin Carbon Arc Ultra-Violet Sun Lamp

An ultra-violet sun ray lamp that also combines infra-red heat-producing rays is announced by the Apollo Manufacturing Company, Cleveland. The hood is of polished aluminum and the standard is nickeled telescopic tubing on a black enamel base. The carbon and reflector unit in the rear of the hood is readily removed with two thumb screws for changing carbons and it is adaptable for either a.c. or d.c. current. There is no interfering glass or wire screen. The lamp burns National C carbons supplying rays through the spectrum from infra-red to ultra-violet at 2,200 AU. This lamp automatically shuts off in twelve to fifteen minutes.

Low-Wattage Continuous Storage Type Heaters

A new line of galvanized tank storage water heaters to meet the demand for off-peak or low-wattage continuous storage type heaters is announced by the Edison Electric Appliance Company, Inc. The heaters are designed for use under the following conditions: First, for automatic service where the heater is turned on and off by the thermostat and a supply of hot water is continuously maintained; second, for off-peak storage service where the "Hotpoint" automatic peak limiter acts to prevent the water heating load from occurring at the time of the range peak, or where the ""Hotpoint" Y-200 time switch operates to cut out the heater at the time of distribution system peak, or provides for night heating alone.

The new line of heaters is designed for use where a rate of $1\frac{3}{4}$ cents per kilowatt-hour, or less, is available.

Electric Hand Saw

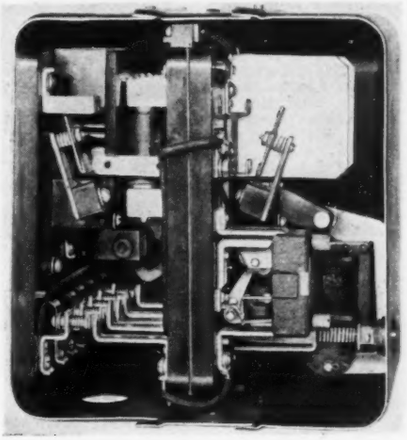
Three sizes of newly designed electric hand saws are announced by the Black & Decker Manufacturing Company, Towson, Md. The sizes are 6 in., 8 in. and 10 in. The saws will crosscut and rip lumber up to $3\frac{1}{2}$ in. thick and in addition can be used with a special metal cutting saw for cutting light gage metal, or with an abrasive disk for cutting slate, marble, tile and porcelain.

The saw blades are inclosed in telescopic guards so that as the saw progresses in the work the guard automatically telescopes, and when the cut is finished the guard snaps back, entirely covering the saw blade. The saw is arranged with an adjustable shoe which can be set to cut at any depth up to the capacity of the saw for cutting rabbets, etc.

The saw can be furnished for 32, 110, 220 or 250 volts and is provided with a Universal motor.

Switch Does Work of Three Devices

A new switch, CR-7006-F-1, taking the place of the magnetic switch, motor circuit switch and inclosed fuses usually required in controlling the operation of a motor, is announced by the General Electric Company. This switch can be applied to control any motor where a



general purpose magnetic switch would be used and where its special features are desirable. It is compact, easily accessible and readily installed.

The switch consists of three sections: A back portion, containing a motor circuit switch; a middle portion, containing a base on the front of which the magnetic switch is mounted and on the back of which clips are provided for fuses, and the front cover. The back portion is built for mounting directly on a wall. No flexible connections are used between sections, so that the switch mechanism may be easily and quickly removed from the mounting in case of trouble or for inspection.

The outstanding advantages of this equipment as listed by the manufacturer are as follows: (1) The switch combines in one box a motor circuit switch, provision for line fuses and magnetic starting switch, the box requiring no more wall space than does the magnetic switch alone and costing no more than the three parts separately; (2) instant replacement is possible in plants having several magnetic switches of one kind, in case any switch is disabled and the switch can be opened without tools in an emergency. Thus disabled switches can be repaired at the convenience of the repair shop; (3) removal and replacement can be accomplished with safety to the repair man; (4) the motor circuit switch will actually handle the stalled motor current and in emergency this switch can be opened safely.

Electrical Patents

Announced by U. S. Patent Office

(Issued April 23, 1929)

1,710,060. CONDUIT FITTING; G. R. Metcalf, Jr., Erie, Pa. App. filed Sept. 8, 1927.

1,710,071. AUTOMATIC CIRCUIT-CONTROLLING MECHANISM; E. H. Remde, Cleveland, Ohio. App. filed Feb. 13, 1922.

1,710,073. ELECTRICAL CONDENSER; S. Ruben, New York, N. Y. App. filed March 21, 1927.

1,710,111. TIME SWITCH; M. H. Rodrigues, Honolulu, Hawaii. App. filed Oct. 27, 1924.

1,710,155. PROCESS AND APPARATUS FOR FORMING OXIDATION PRODUCTS OF HYDROCARBON OILS; G. E. and J. C. Morrell, Chicago, Ill. App. filed July 20, 1922.

1,710,172. GUARD FOR SWITCH BOXES; M. P. Luther, Chicago, Ill. App. filed March 21, 1927.

1,710,173. ELECTRIC SWITCH; M. P. Luther, Chicago, Ill. App. filed March 21, 1927.

1,710,180. CUSHION DEVICE FOR TOOLS AND THE LIKE; H. L. Moore, Detroit, Mich. App. filed May 9, 1927.

1,710,189. INSULATOR RACK; C. L. Peirce, Jr., Pittsburgh, Pa. App. filed May 27, 1922.

1,710,196. ELECTRIC-HEATER UNIT; J. H. Simon, Oakland, Calif. App. filed Jan. 11, 1928.

1,710,223. METHOD OF AND MEANS FOR ELECTRICALLY CONTROLLING THE SPEED AND PHASE OF DISTANTLY-SITUATED MACHINES AND APPARATUS; M. Jacobson, New York, N. Y. App. filed June 28, 1924.

1,710,256. ELECTRICAL DISTRIBUTION SYSTEM; F. Grieb, Baden, Switzerland. App. filed Jan. 25, 1927.

1,710,258. ELECTRIC WELDING APPARATUS; W. R. Hume, Melbourne, Victoria, Australia. App. filed Aug. 28, 1924.

1,710,264. SWITCH SOCKET; F. L. Larava, Worcester, Mass. App. filed June 30, 1926.

1,710,269. ELECTRICAL PLUG; R. H. Olley, Syracuse, N. Y. App. filed Oct. 13, 1927.

1,710,312. ARMORED ELECTRIC CABLE; G. A. Johnson, Irvington, N. J., App. filed Dec. 1, 1925.

1,710,313. COMBINED VENTILATING AND DRAINING UNION FOR ELECTRIC-CIRCUIT-WIRE CONDUITS; G. A. Johnson, Irvington, N. J. App. filed Jan. 9, 1926.

1,710,340. ELECTRIC MARKING DEVICE; R. H. Bresson and E. V. Knoblock, Detroit, Mich. App. filed Dec. 30, 1926.

1,710,348. CIGAR LIGHTER; J. H. Cohen, Bridgeport, Conn. App. filed Sept. 8, 1928.

1,710,367. TIME SWITCH; W. Luczak, Jersey City, N. J. App. filed Feb. 1, 1927.

1,710,373. SAFETY LAMP LOCK; R. A. Moore, New York, N. Y. App. filed Feb. 4, 1928.

1,710,391. HEATER FOR ENGINE WATER CIRCULATING SYSTEMS; C. F. Walz, Minneapolis, Minn. App. filed July 2, 1928.

1,710,411. ELECTRIC SWITCHING MECHANISM; H. A. Douglas, Bronson, Mich. App. filed Nov. 17, 1927.

1,710,412. ELECTRICAL CONDENSER; W. Dubilier, New Rochelle, N. Y. App. filed Nov. 30, 1925.

1,710,416. CONNECTOR; R. A. Geoller, Larchmont, N. Y. App. filed April 16, 1927.

1,710,428. METHOD AND MACHINE FOR MANUFACTURING INCANDESCENT LAMPS AND SIMILAR ARTICLES; K. Mey, Berlin, Germany. App. filed Oct. 5, 1925.

1,710,511. ELECTRIC HEATING APPARATUS; D. G. Petrie, Bexley Heath, England. App. filed March 15, 1928.

1,710,512. HEATING ELEMENT; F. D. Pitt, Kansas City, Mo. App. filed July 15, 1927.

1,710,531. ELECTRICAL DEVICE; J. H. Cohen, Bridgeport, Conn. App. filed Feb. 17, 1928.

1,710,535. MEANS IN THE FEED LINE FOR PREVENTING THE FORMATION OF SCALE IN A BOILER; J. W. Fowler, Cleveland, Ohio. App. filed Nov. 9, 1926.

1,710,541. HIGH-FREQUENCY OSCILLATING CIRCUITS; H. B. Holthouse, Chicago, Ill. App. filed Feb. 11, 1924.

1,710,542. EMERGENCY LIGHTING SYSTEM; M. H. Landis, Waynesboro, Pa. App. filed July 14, 1926.

1,710,545. AUTOMATIC STATION-SIGNAL DEVICE; J. Maldonado, New York, N. Y. App. filed May 11, 1927.

1,710,615. ELECTRICAL IGNITER FOR CENSER FUEL BLOCKS; R. A. Gallery, Bethesda, Md. App. filed Jan. 17, 1928.

1,710,617. PASTED ACCUMULATOR GRID OR PLATE; W. Haddon, London, and J. McD. Burnett, Weston-By-Welland, England. App. filed April 14, 1927.

1,710,640. OFFSET CONDUIT-ELBOW FITTING; J. W. Hooley, Larchmont, N. Y. App. filed April 14, 1928.

1,710,664. UNIVERSAL RELAY; W. K. Howe, Rochester, N. Y. App. filed July 19, 1920.

(Issued April 30, 1929)

1,710,681. MAXIMUM-DEMAND-LOAD REGULATOR; H. S. Bean, Wilmington, Del. App. filed April 2, 1927.

1,710,707. RADIAL FLOW CONDENSER; D. W. R. Morgan, Swarthmore, Pa. App. filed Sept. 28, 1927.

1,710,717. ELECTRIC SOCKET; L. Smith and J. W. Scott, Kennard, Ind. App. filed Dec. 29, 1927.

1,710,723. WELDING-CURRENT-CONTROL CIRCUIT; H. A. Delano, York, Pa. App. filed Jan. 10, 1927.

1,710,748. GENERATOR-CONTROL SYSTEM; P. B. Steed, Wilkinsburg, Pa. App. filed March 1, 1924.

1,710,755. GENERATOR-VOLTAGE REGULATOR; C. P. West, Pittsburgh, Pa. App. filed Dec. 9, 1927.

1,710,760. MAGNETIC SHARPENER FOR RAZOR BLADES AND THE LIKE; G. Yates, Detroit, Mich. App. filed May 31, 1927.

1,710,761. ALTERNATING-CURRENT ELECTROMAGNET; N. K. Andersen, Wilkinsburg, Pa. App. filed Oct. 20, 1927.

1,710,763. ELECTRICALLY-HEATED FURNACE; C. A. Cadwell, Cleveland, Ohio. App. filed April 16, 1924.

1,710,767. BRAKE; J. Dunlop, Chicago, Ill. App. filed June 24, 1927.

1,710,845. CABLE STRUCTURE; D. M. Simons, Osborne, Pa. App. filed March 19, 1925.

1,710,859. SWITCH MECHANISM; A. W. Burks, Decatur, Ill. App. filed Dec. 1, 1921.

1,710,862. IGNITION COIL; W. A. Chryst, Dayton, Ohio. App. filed Nov. 21, 1927.

1,710,873. RAIL BOND; W. F. Hart, Pittsburgh, Pa. App. filed Jan. 31, 1925.

1,710,880. INSULATOR STACK; J. S. Lapp, Le Roy, N. Y. App. filed May 19, 1927.

1,710,884. SWITCH; M. Mackie, Waukesha, Wis. App. filed Feb. 1, 1924.

1,710,895. SYSTEM OF ELECTRICAL DISTRIBUTION; E. C. Raney, Columbus, Ohio. App. filed Dec. 29, 1921.

1,710,912. IGNITION-SWITCH LOCK; F. W. Andrew, Andalusia, Pa. App. filed Oct. 7, 1926.

1,710,939. AUTOMATIC RECLOSING CIRCUIT-BREAKER SYSTEM; J. W. McNairy, Schenectady, N. Y. App. filed Oct. 3, 1924.

1,710,943. STEAM-GENERATOR HEATING UNIT; J. B. Odell, Riverside, Calif. App. filed April 18, 1928.

1,710,945. FLASHER OR MAGNETIC ACTUATOR FOR SWITCHES AND THE LIKE; H. J. Otto, Evansville, Ind. App. filed May 27, 1927.

1,710,955. THERMOSTATIC PLUG; G. W. Ufford, Philadelphia, and H. E. Allen, Highland Park, Pa. App. filed May 19, 1927.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Cape Town, South Africa (No. 38,198), for electric hand drills.

An agency is desired in Athens, Greece (No. 38,179), for electric fans.

Purchase is desired in Rabaul, New Guinea (No. 38,154), of flashlights.

An agency is desired in Montreal, Canada (No. 38,126), for floor-scrubbing machines and vacuum cleaners.

An agency is desired in Liverpool, England (No. 38,127), for household electrical appliances (coffee percolators, tea kettles, irons and washing machines), and electric refrigerators.

Purchase is desired in Guiseley, England (No. 38,125), of starting switches for small A.C. motors.

New Trade Literature

LIGHTNING ARRESTERS.—Booklet No. 266 issued by the Electric Service Supplies Company, Seventeenth and Cambria Streets, Philadelphia, entitled "Lightning Valves," is the fourth of a series covering the technical features of the crystal valve lightning arrester as they apply to modern lightning protection.

TRANSFORMERS.—The Kuhlman Electric Company, Bay City, Mich., has issued bulletin No. 27, which describes the Kuhlman power and distribution transformers in single-phase and three-phase type. The bulletin is well illustrated and contains photographs showing the various installations of the transformers. The construction of the transformers and the ratings, shipping weights, prices, dimensions, drawings, etc., also are included.

MOTORS.—The Wagner Electric Corporation, 6400 Plymouth Avenue, St. Louis, is distributing bulletin No. 163, covering its rubber-mounted motors in ratings of ½, ¾ and 1 hp., developed especially for applications requiring ultra-quiet performance.

ELECTRIC FURNACES, SWITCHES, ETC.—The General Electric Company, Schenectady, N. Y., has issued a series of bulletins: GEA-37D describes its types RRB and RRC direct-heat electric furnaces, GEA-181A covers the CR7006-D7 and D9 inclosed magnetic switches for alternating-current motors, GEA-716B covers its type DT-2 totalizing relay, GEA-801A describes the G-E electrically heated tempering baths, GEA-788A describes its type FT normal starting torque for full voltage starting general purpose squirrel-cage motors, GEA-1114 covers the CR950-A1 and B1 solenoid-operated valves for the remote control of liquids and gases under pressure and bulletin GEA-982A entitled "Airport Illumination" describes the applications and the design of General Electric equipment for airports.

WIRING TROUGHS AND FITTINGS, SAFETY SWITCHES, ETC.—Catalog No. 29 issued by the Bull Dog Electric Products Company, Detroit, contains prices and data on Bull Dog wiring troughs and fittings, safety switches, "Fusenters" and "SaftoFuse," "Unit-Versal" metering panels and cabinets, "Unit-Versal" lighting panels and cabinets, "SaftoFuse" feeder panels and cabinets, dead-front safety switchboards, knife switches and switchboard parts.

AIR MOTOR STARTER.—The Condit Electrical Manufacturing Corporation, Boston, is distributing bulletin No. 482 containing descriptions, dimensions, prices and a wiring diagram of its type A-30 air motor starter.

MOTORS AND LINE STARTERS.—Leaflets No. L1150-C and No. L20,403 issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., describe and illustrate respectively the types G and HG high speed synchronous motors for coupled, belted and geared service and the class 11-210 reversing line starters for squirrel-cage induction motors.

ROLLER CHAINS.—"Reducing the Cost of Power Transmission" is the title of booklet No. 102A issued by the Diamond Chain & Manufacturing Company, Indianapolis, Ind. This booklet treats in detail with modern engineering practice in power drives and explains how roller-bearing action has been applied to power transmission with a saving in power and maintenance costs. Many typical installations also are described and illustrated.

CONTROLS.—The Mercoid Corporation, 564 West Adams Street, Chicago, is distributing catalog No. H5 describing and illustrating a complete line of Mercoid automatic controls for domestic and industrial heating equipment.

STEEL POLES AND FRAMES.—Catalog No. 1305 issued by the Truscon Steel Company, Youngstown, Ohio, covers the Truscon copper alloy "Weltrus" steel poles and "H" frames. It contains complete engineering tables and detailed drawings of pole construction, data on pole fittings and accessories, and descriptions of "Weltrus" and Z type poles. The "Weltrus" H frames, catenary hangers, floodlights and other towers, the various methods of setting poles, footings and Truscon windows and window operators for use in power houses are described and illustrated. Views showing installations of "Weltrus" poles and a complete cable code for use in ordering poles and fittings are included.